COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY

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BY

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Dedicated

to

my Family

&

Teachers

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ABBREVIATIONS

AG gap	Air Bone Gap
ASOM	Acute Suppurative Otitis Media
CSOM	Chronic Suppurative Otitis Media
EA	Endaural
ET	Eusctachian Tube
HOM	Handle Of Malleus
PA	Post Aural
PTA	Pure Tone Audiometry
TC/PM	Trans-Canal/Per meatal

ABSTRACT

Introduction: Tympanoplasty is an established operative procedure for reconstruction of the tympanic membrane perforation in patients suffering from Chronic Suppurative Otitis Media. The repair of tympanic membrane perforation re-establish the protective function of the tympanic membrane to the middle ear from external environment allergens and infective organs, and re-establish the vibratory area of the tympanic membrane. This study intends to compare the results of two different techniques of tympanoplasty i.e malleus medialisation and lateralisation tympanoplasty in almost similar setup.

Aims and objectives: To study the 1) To observe the surgical outcome of tympanoplasty in safe ear CSOM cases in the form of graft uptake, position of graft and mobility of graft. 2) To evaluate the success of tympanoplasty in the form of audiological hearing gain.

Material and Methods: In this study the results of two different tympanoplasty technique were compared. 50 cases with diagnosis of Chronic Suppurative Otitis Media were selected from ENT OPD of Dayanand Medical College & Hospital Ludhiana. 2 different techniques of tympanoplasty were used and 25 cases of each technique were taken. All the patients fulfilled the standard criteria for tympanoplasty.

Results: In our study it was seen that medialisation tympanoplasty was better than lateralisation tympanoplasty with graft uptake rate of 96% and 92% respectively, Overall graft uptake rate was 94%. Hearing gain was equal in both groups with success rate of 80%. AB gap shift was 72% with medialisation and 82% with lateralization tympanoplasty.

Conclusion: Medialisation tympanoplasty gave better results in both graft uptake and hearing gain and, graft uptake is best in perforation repair with canaloplasty.

Keywords: Tympanoplasty, Medialisation, Lateralisation, Perforation, Hearing gain.

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KEY TO MASTER CHART

C/C	Chief complaint
DIS	Discharge
HL	Hearing loss
M	MALE
F	Female
ASOM	Acute suppurative otitis media
E.DROPS	Ear drops
C/S Report	Culture sensitivity report
S. TOTAL	Sub total
CIPRO	Ciprofloxacin
M FLOX	Moxifloxacin
CLOT	Clotrimazole
STAPH	Staphylococcus
AB GAP	Air bone gap
GA	General anaesthesia
TFG	Temporalis fascia graft
PG	Perichondrium graft
EA	End-aural
TC	Trans-canal
PA	Post-aural

INTRODUCTION

Chronic suppurative otitis media is a insidious disease defined as the persistent infection or inflammation of the middle ear and the mastoid air cell system, It typically involves a perforation of the tympanic membrane with intermittent or continuous otorrhea. Moreover it increases the likelihood of cholesteatoma formation.[1]

Long standing perforation leads to recurrent ear discharge, recurrent otitis externa and even threatens inner ear function.[2] It clinically manifests as discharge from the ear and reduced hearing and affects both sexes in all age groups.

Prevalence of chronic otitis media is estimated to be 0.5-30% with 120 million patients around the world. Essential treatment of chronic otitis media is by surgical intervention to eliminate disease, prevention of recurrence and maintain or improve hearing. About 70000 “tympanoplasty” and “mastoidectomy” operations are performed annually in The United States.[3]

A perforation of the tympanic membrane leads to defect in impairment of the protective function of the Eustachian tube and the middle ear so that there is no air cushion protecting the middle ear and mastoid air cells, thereby secretion from the nasopharynx enter the middle ear through the eustachian tube leading to further hearing impairment. Charles and Bluestone 1983.

Tabb and Shea first innovated medial positioning of grafting tissue to malleus and residual tympanic membrane.[4-7]

Otologic surgeons may choose either method depending on the characteristics of the defect.[8]

According to the American Academy of Ophthalmology and Otolaryngology Subcommittee on Conservation of Hearing 1965, ‘tympanoplasty’ is a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting.[9]

Major prerequisite for a successful tympanoplasty are a dry ear /Armstrong, 1965 and a good Eustachian tube function Miller 1965, Flisberg, 1966. Para nasal sinuses and throat should be free of any infective focus P.C. Chamyal, S.R.V. Kessar et al., Sept. 1981. The mucosa of middle ear should appear to be normal to the naked eye and on otomicroscopy T. Palva, 1970.

Grafting the tympanic membrane with an autologous temporal fascia create a functional middle ear free of infection which clinically means closure of air bone gap and a dry ear. Adolph Wolferman, 1980.

Conventionally, surgeons perform tympanoplasty on ears with active drainage after drying the ear, but in many cases this is practically impossible because the discharge from the ear continues despite receiving medical treatment.[10]

There are two techniques of tympanoplasty with respect to placement of the graft ie. overlay and underlay technique.[11]

The classical overlay technique was described bt Sheehy in 1967. In this, incision in the bony canal wall is made along the two suture lines. Demarcating the vascular strip. The canal skin is elevated from the bone as far as the fibrous annulus. The annulus is not elevated from the bony sulcus. The dissection is continued into the tympanic remnant separating the squamous epithelial layer from the middle fibrous layer. The tymporalis fascia placed on the fibrous layer of tympanic membrane. A small slit on the fascia allows this to envelop the handle of malleus (Sheehy, 1967).

Fisch(1981) recommends an overlay technique for perforation which do not have an anterior rim and overlay technique for those with an anterior rim. If blunting and lateralization kept to minimum the hearing result of overlay procedure can be quite good. Uptake rates are excellent (Glascock, 1973).

Underlay technique was first described by Shea et al, 1960. In this technique, temporalis fascia graft placed below the tympanomeatal flap

extending upto the anterior limit of annulus and medial to the handle of malleus.

The solution of problems like blunting, lateralization, pearl formation, delayed healing associated with overlay technique has been dealt with using underlay technique. Shambaugh, 1990.

The main reason in deciding to use underlay techniques was it being faster and easier to perform. Symth, 1970 and to prevent the complications of blunting and epithelial pearls underlay technique is advocated. Glasscock, 1973.

In underlay technique the fascial graft is pierced in order to make a hole for the malleus handle to pass through it. At first, the hole is passed through the tip of malleus handle and then the graft is stretched over it to fit around the neck of malleus so that the graft lodges medial to malleus.

There are chances of lateral migration of the tympanic membrane away from the handle of malleus, leads to conductive hearing loss, may occur after some time and is most frequently seen when graft placed lateral to the handle of malleus rather than medial to it.

AIMS & OBJECTIVES

i. To observe the surgical outcome of tympanoplasty in safe ear CSOM cases in the form of graft uptake, position of graft and mobility of graft.

ii. To evaluate the success of tympanoplasty in the form of audiological hearing gain.

REVIEW OF LITERATURE

History-

Hippocrates 460-377 BC emphasized that the 'organ of hearing' the tympanic membrane which resembled a 'dry spun web'.[12]

"Acute pain of the ear, with continued strong fever, is to be dreaded, for there is danger that the man may become delirious and die." Hippocrates, recognized that a painful, discharging ear with fever was a life-threatening condition and described classic symptoms of otitis media.

Fallopius (1523-1563) first used the term —tympanum.

Benzer 1640 first attempted to close the tympanic membrane perforation and it has been documented in otologic literatures.

Jasser 1776, successfully performed a mastoid operation on a soldier with a draining ear.

In 1853 Toynbee used a thin rubber membrane with a silver thread attached to its centre and a silver stem to assist placement.[13]

Herman Schwartzeg 1873, published both the indications and the procedure for removing the mastoid cortex and the underlying air cells with a mallet and chisel for acute mastoid infection.

Politzer 1885 advocated the technique of closing perforations by 'scars' induced by circumferential cautery of the edges of the perforation.

Katz 1889 covered the perforation with a thin membrane of colloid.

Sheehy 1967 had 97.5% success rate using temporalis fascia.[14]

The tympano-ossicular system is discussed from the following aspects-

A) Anatomical aspect
B) Physiological aspect
C) Audiological aspect
D) Pathological aspect
E) Surgical aspect

A) ANATOMICAL ASPECTS

Hearing in humans plays a central role in social communication, while also serving as a warning and orientation system that functions in all spatial directions. Rudolf et al., 2006

1. EXTERNAL AUDITORY CANAL

External ear consists of auricle and external auditory canal.Auricle has characteristic shape which helps to collect air vibratitions.It has thin plate of cartilage covered with skin.

Extrinsic and intrinsic muscles are supplied by branches of facial nerve.External auditory meatus has two parts, cartilaginous and bony,it is 'S' shaped. [15]

The cartilaginous portion

Also known as meatus acusticus externus cartilaginous, it is around 8 mm. in length; it is firmly adherent to the circumference of the auditory process of the temporal bone and continuous with the cartilage of auricle. The cartilage is deficient at the upper and back part of the meatus, its place being supplied by fibrous membrane; there are two or three deep fissures present in the anterior part of the cartilage.

The osseous portion

Also known as meatus acusticus externus osseus and, is around 16 mm. in length, and is slightly narrower than the cartilaginous part. It is directed inward and a little forward, forming in its course is slight curve with the convexity of which is upward and backward. Its inner end is smaller than the outer, and sloped, the anterior wall projecting beyond the posterior for about 4 mm.; it is marked, except at its upper part, by a narrow groove, the tympanic sulcus, in which the circumference of the tympanic membrane is attached. Its outer end is dilated and rough in the greater part of its circumference, for the attachment of the cartilage of the auricle. The front and lower parts of the osseous portion are formed by a curved plate of bone, the tympanic part of the temporal, which, in the

fetus, exists as a separate ring (annulus tympanicus,) incomplete at its upper part. [16]

The skin lining

It is very thin; adheres closely to the cartilaginous and osseous portions of the tube, and covers the outer surface of the tympanic membrane. After maceration, the thin pouch of epidermis, when withdrawn, preserves the form of the meatus. In the thick subcutaneous tissue of the cartilaginous part of the meatus are numerous ceruminous glands, which secrete the ear-wax; their structure resembles that of the sudoriferous glands.

Relations of the Meatus

In front of the osseous part is the condyle of the mandible, which however, is frequently separated from the cartilaginous part by a portion of the parotid gland. The movements of the jaw influence to some extent the lumen of this latter portion. Behind the osseous part are the mastoid air cells, separated from the meatus by a thin layer of bone.

The blood supply

The meatus is supplied by branches from the posterior auricular, internal maxillary, and temporal artery.

The nerve supply

It is derived from the auriculotemporal branch of the mandibular nerve and the auricular branch of the vagus.[17]

2. **THE TYMPANIC MEMBRANE-**

Tympanic membrane is a partition between the middle ear and the external ear. Tympanic membrane is derived from the invagination and union of the first pharyngeal groove with its pharyngeal pouch, So it has all three germ layers. It lies oblique with its postero-superior end more lateral than its antero-inferior part. It is 8-9 mm wide, 9mm tall and 0.1 mm in thickness. The area of the tympanic membrane is 85-90 mm^2 square but the effective vibratory area is only 2/3.[18]

Tympanic membrane is semitransparent and divided into two parts-

a) Pars tensa-

Annulus tympanicum is a circumferential fibrocartilagenous ring of the pars tensa, which fits it in the tympanic sulcus. Umbo is the tip of the handle of malleus in the centre of the tympanic membrane. In the antero-inferior quadrant a bright cone of light which is seen arising from the tip of the handle of malleus and radiating to the periphery. Tarabichi M st al. 2013.

b) Pars flaccida (Shrapnell's Membrane)-

Pars flaccida lies between the lateral process of malleus between the notch of Rinvius and the anterior and posterior malleal folds. It is a region with pinkish colour. Tarabichi M et al. 2013.[19]

The layers of the tympanic membrane-[20]

- Outermost (cutaneous-ectoderm)

  It is thin skin continuous with the lining of the meatus i.e keratinize stratified squamous epithelium.
- Middle(connective tissue mesoderm)

  It is continuous with the mucosa of middle ear.
- Radiate(radiatum)

  It is fibro elastic connective tissue that encloses the handle of malleus and has three types of fibres that are radial, circular, parabolic.[21]

The fibrous layer in the pars flaccida is thin and not organized into various fibres as in pars tensa. Lim DJ, 1995.

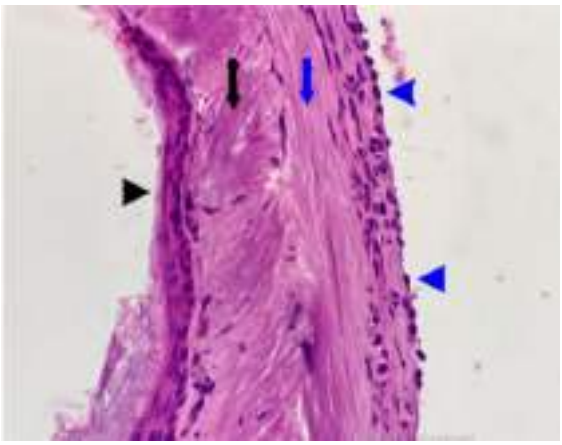


Fig.1 Tympanic membranes cross sectional picture

Black arrow head- lateral surface, lined by stratified squamous epithelium.

Blue arrow heads- medial surface, lined by cuboidal epithelium.

Black arrow- radial collegen fibres .

Blue arrow- circular collegen fibres. [23]

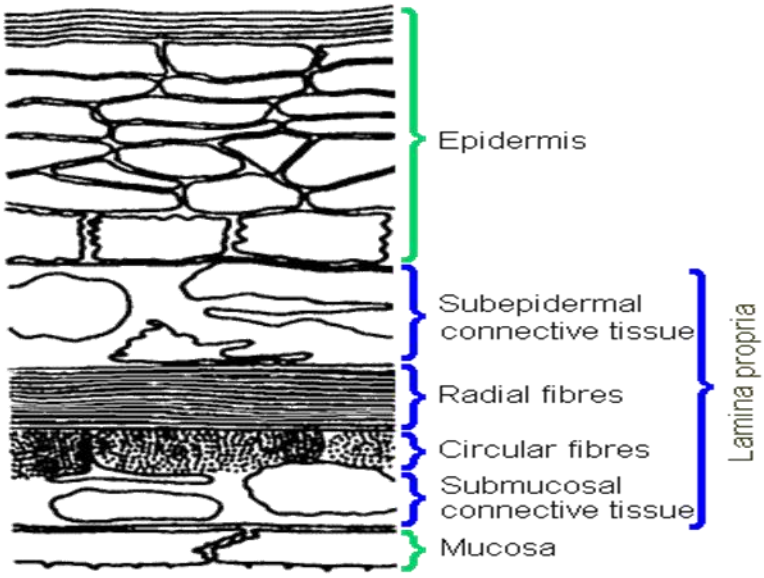


Fig.2 SCHEMATIC DIAGRAME OF LAYERS OF THE TYMPANIC MEMBRANE

Blood supply of the tympanic membrane-

The deep auricular branch of the internal maxillary artery supplies the lateral side of the tympanic membrane.

The inner surface of the membrane is supplied by

I. A small stem from the middle meningeal artery

2. The vascular circle formed by -

a) The internal maxillary gives the anterior tympanic artery which enters the middle ear through the petrotympanic fissure along the exit of the chorda tympani

b) A branch of the internal maxillary artery, the posterior tympanic artery entering the middle ear along with the chorda tympani, and

c) A very small branch of the ascending pharyngeal anastomosis.[24]

Nerve supply of the tympanic membrane-

The medial surface of the tympanic membrane has sensory innervation from the tympanic branch of the glossopharyngeal nerve (CN 9), And lateral surface from the auriculotemporal nerve which is a branch of the trigeminal nerve (V3), The auricular branch of facial (CN 7), auricular branch of vagus nerve (CN 10), and the glossopharyngeal nerve (CN 9)too innervated the lateral side.[25]

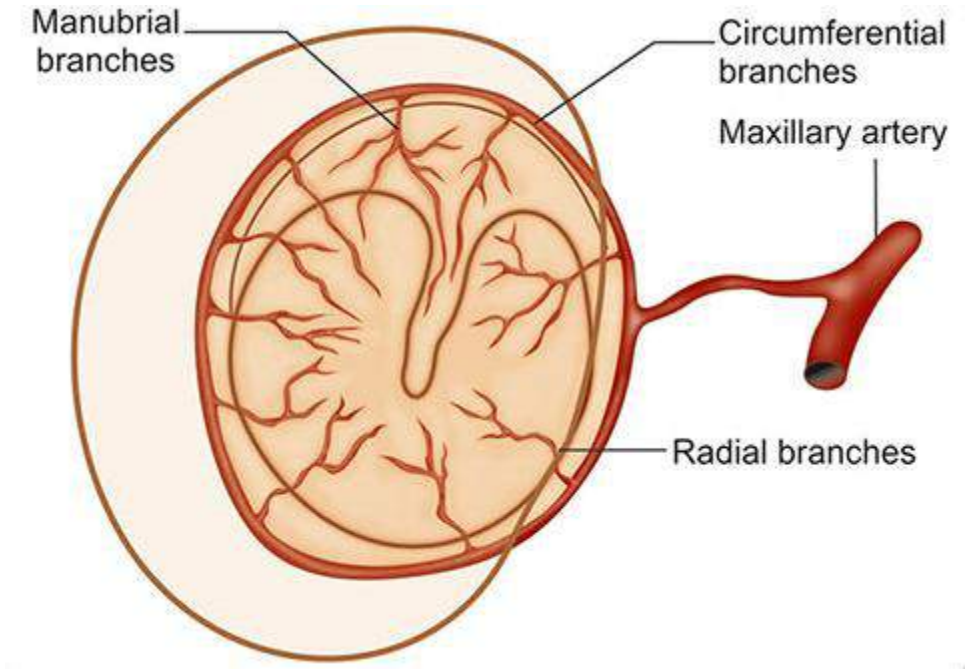


Fig.3 VASCULATURE OF THE TYMPANIC MEMBFRANE

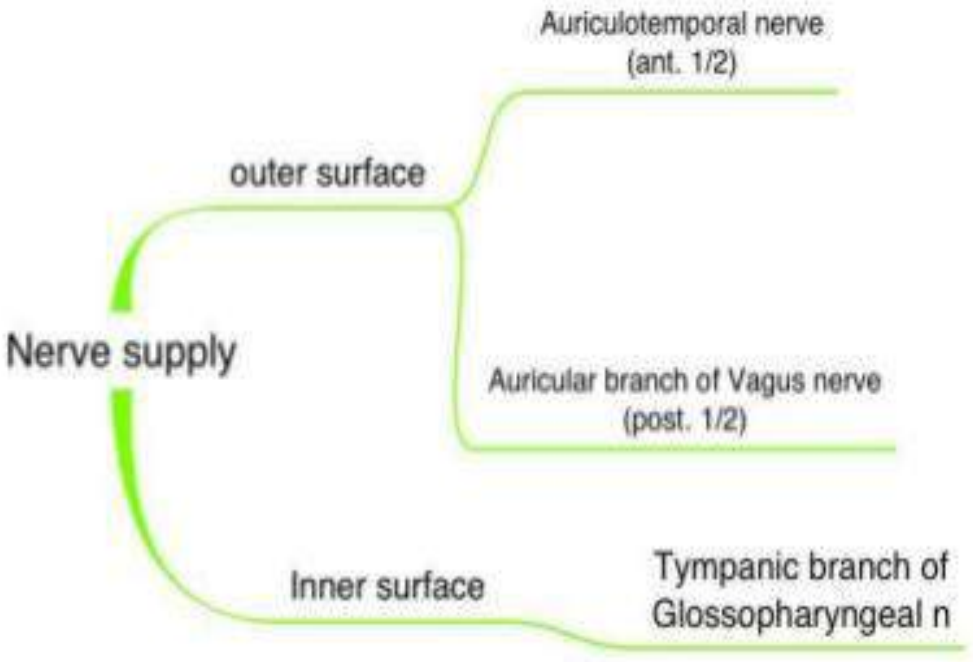


Fig.4 INNERVATION OF THE TYMPANIC MEMBRANE

3. THE INTRA TYMPANIC MUSCLES

These are essential for initiating waves in the endolymph of the cochlea. The amplification achieved by the action of two muscles that are attached to the ossicles and which act as antagonists of each other. There is no direct muscle attachment to the tympanic membrane. The tensor tympani and stapedius are the two muscles of the middle ear.

- **Tensor tympani-**

The tensor tympani muscle developes from the first pharyngeal arch. The tensor tympani muscle is innervated by the tensor tympani branch of mandibular division of trigeminal nerve. It originates from cartilaginous part of the eustachian tube, the greater wing of sphenoid and the petrous part of temporal bone, and inserts on the neck of malleus. The contraction of this muscle tenses the ossicles, pulls the malleus medialy and thereby the tympanic membrane, all of which further results in a greater sensitivity. The tensor tympani muscle pulls the malleus medialy increases the tension across the tympanic membrane thus to effectively stiffens it. This action is a part of the acoustic reflex, and it protects the tympanic membrane and the cochlear apparatus from acoustic trauma of the loud sounds including the sound of chewing and talking.[26]

- **Stapedius-**

The stapedius muscle develops from second pharyngeal arch. It originates from the wall of the tympanic cavity called pyramidal eminence, and inserts on the head of the stapes. The stapedius muscle is innervated by the branch from facial nerve. Contraction of this muscle pulls the end of the stapes away from the oval window, thereby reducing the force of the transmission of sound vibrations.[27,28] Zwislocki J 1975, Austin DF 1990.
The stapedius is the shortest muscle of the human body which completes the reflex arc by retracting the stapes from the oval window to avoid damage to the cochlea from the high amplitude vibrations. This acoustic reflex takes 40 ms to occur, so it is ineffective in loud sounds, eg. Gunshot.[29-30]

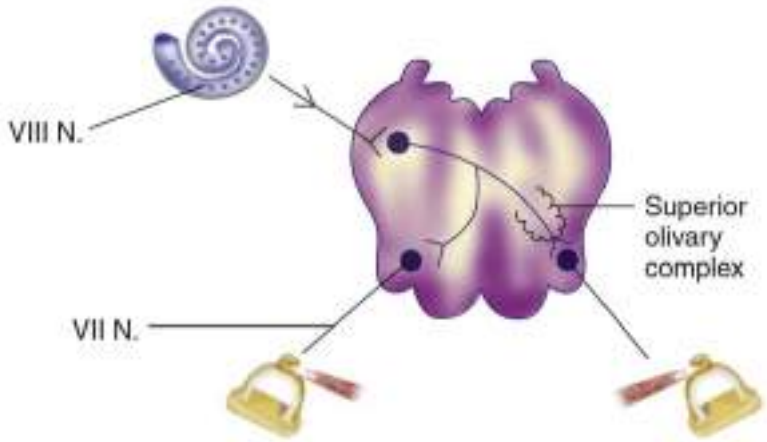


Fig.5 STAPEDIAL REFLEX ARC [31]

4. THE OSSICULAR SYSTEM

Ear ossicles were first described in the 16th century. Vesalis described the malleus and incus in 1543. Ingrassia and Eustachius described the stapes in 1546.

The ossicles lie in the tympanic cavity like a chain and are the malleus, incus and stapes. These ossicles are held together by articulating joints and connecting ligaments. They transmits the sound vibrations to the oval window from the tympanic membrane.[31]

- **Embryology -**

Malleus has a composite structure, most of it is formed from endochondral bone, but the os goniale, which will form its anterior process has intramembranous ossification which develops separately from the rest of the ossicle .Hanson & Anson, 1962; Rodríguez Vázquezet al. 1991; Tucker et al. 2004.

The development of the ear ossicles begins at fourth week of intrauterine life, fully ossify in the fourth month of intrauterine life and attain their full life-time size at birth.[32]

The endochondral component of the malleus and the entire incus develop from the first pharyngeal arch cartilage, of neural crest origin during the 6th to 8th week of embryological life. Most of the stapes develops from the 2ndpharyngeal arch cartilage, except for the outer edge of its footplate which has a mesodermal origin, Thompson et al. 2012. Stapes is the smallest and lightest bone of the human body.

- **Shape of the ossicles-**

Malleus is shaped like a hammer.

Incus is 2ndossicle and is bicuspid shaped.

Stapes is stirrup shaped and it is the smallest bone of the human body.

- **Orientation of ossicles**

The malleus is the lateral most ossicle then comes incus and 3rd and medial most ossicle is stapes.

- **Parts of the ossicles**

The malleus consists of a head, neck, lateral process, anterior process and a handle or the manubrium.[33] The incus consists a body and two processes i.e short process and long process. The stapes has four components, a footplate, two crura (anterior and posterior) and a head.

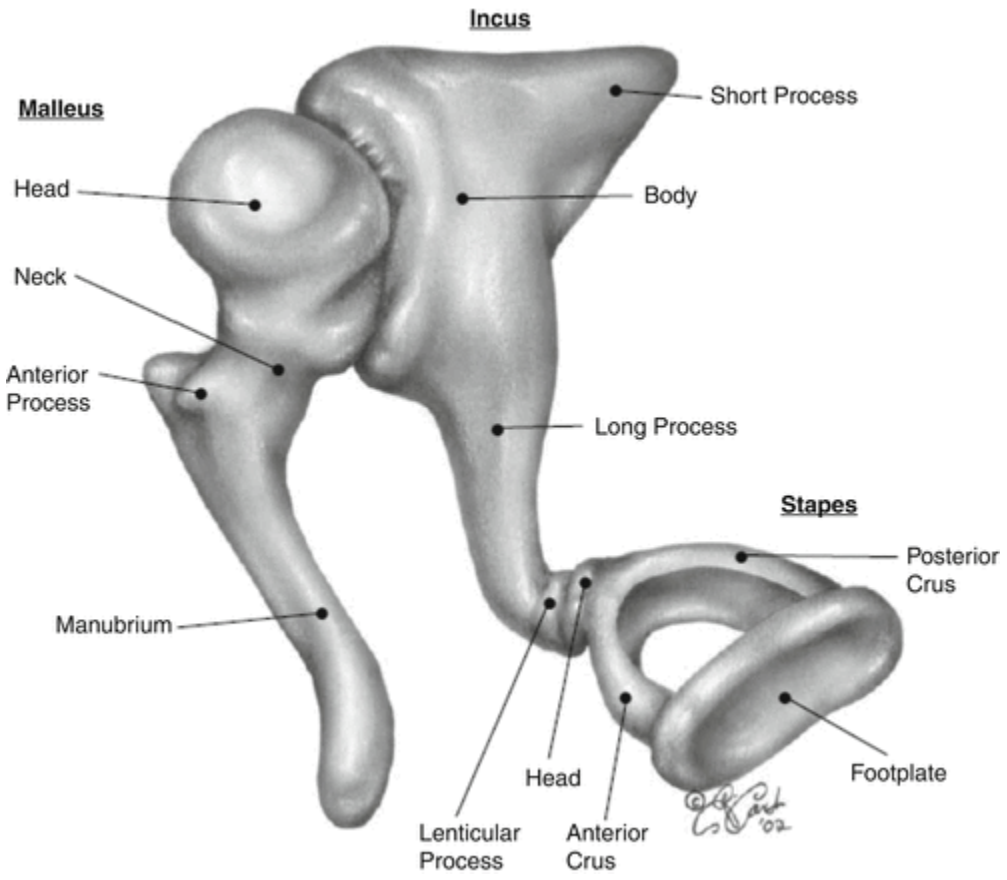


Fig.6 THE OSSICULAR ORIENTATION [34]

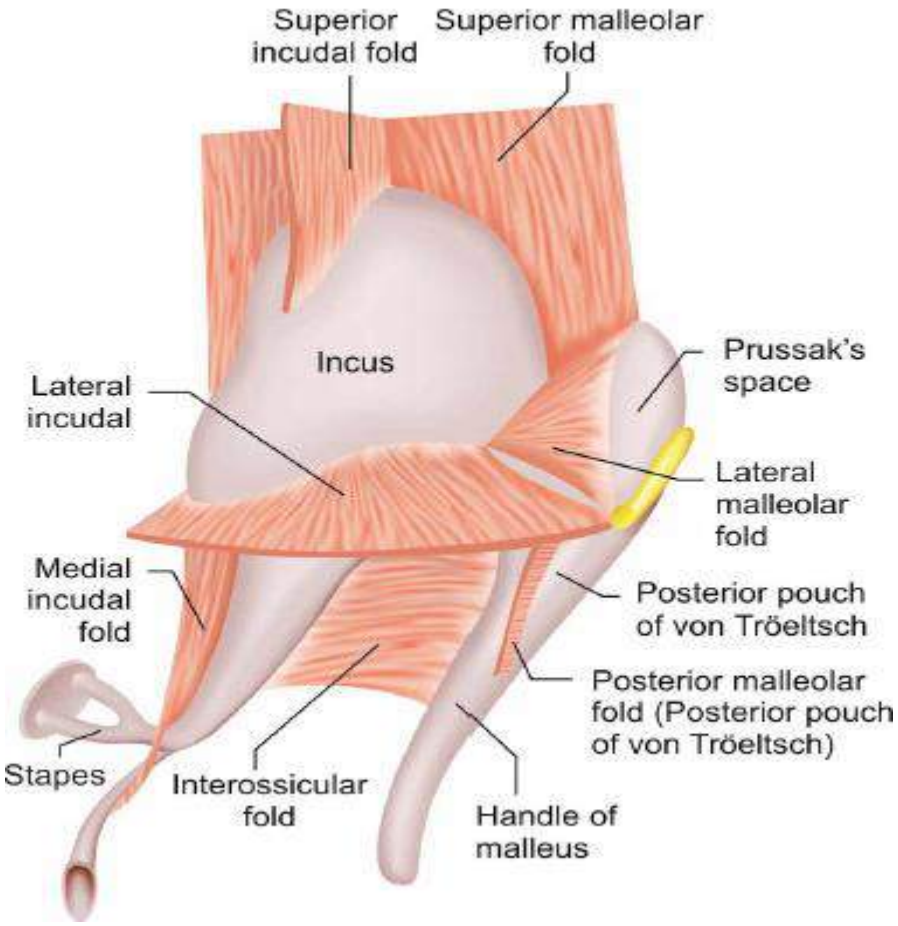


Fig.7 MIDDLE EAR MUCOSAL FOLDS [35]

- **Articulation surfaces of the ossicles-**

The articular surface of the malleus resembled an elongated saddle which articulates with the body of the incus by way of a saddle type of synovial joint.

The anvil shaped incus is the second ossicle which articulates with the head of the malleus antero-medially forming the incudo-malleolar joint, and infero-medially with the stapes forming incudo-stapedial joinst. The head of stapes is a cup shaped depression, which articulates with the lenticular process to form a synovial ball and socket type, the 'incudo-stapedial' joint.

Stapes has a base (or footplate) which is convex and firmly attached to the oval window. The annular ligament anchors the stapes. The stapedius muscle is attached to the shorter posterior crus proximal to the head of the stapes.

The malleus shows variations in its distal portion, i.e., at the free ends of the manubrium, and its processes the lateral and the anterior. The free end of manubrium may be anteriorly directed, curved or lie in a straight line.

- **Vascularity of the ossicles-**

Malleus is supplied by two nutrient branches from the anterior tympanic artery, superior and the inferior branch. The superior branch traverses the mucosal fold to the head of malleus where it penetrates into the bone through a nutrient foramen.

The incus is supplied by the ossicular branch of the anterior tympanic artery, which enters in to the middle ear through the retrotympanic fissure.

- **Amplifications by the tympano ossicular system-**

Malleus amplifies sound by 1.3 times. [36] The outer and middle ears amplify sound on its passage from the exterior to the inner ear by about 30 dB

5. The eustachian tube-

Eustachian tube or the pharyngotympanic tube communicates the middle ear cavity with the nasopharynx. In the middle ear eustachian tube opens on the anterior wall and in the nasopharynx opens just posterior to the inferior nasal concha and lateral to the adenoid pad. It has a bony part and a cartilaginous part. The bony part is 12mm and cartilaginous 24 mm in length. Narrowest part is known as the isthmus. It equalizes the atmospheric pressure in the middle ear, and protects the middle ear from unwanted effects of pressure changes on deglutition , yawning and on ascent and descent. Moreover eustachian tube drain the middle ear secretions into the nasopharynx. The eustachian tube has physiological and pathological importance. Eustachian tube dysfunction leads to otitis media with effusion. [37,38]

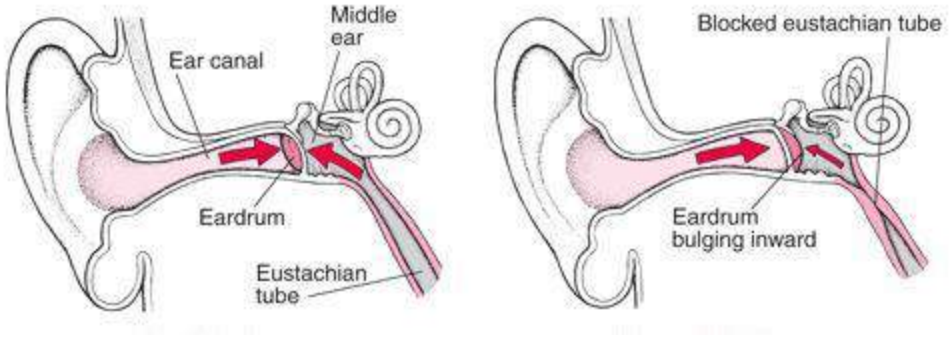


Fig.8 EUSTACHIAN TUBE AND THE POSITION OF THE TYMPANIC MEMBRANE

B) PHYSIOLOGICAL ASPECTS-

The sound waves are funneled by the pinna and transmitted by the external auditory canal and the tympanic membrane. The ossicles conduct through the oval window to the inner ear. The inner ear converts sounds to electrical impulses which transmitted to the brain. Stevens SS et al 1938.

The sound vibrations are amplified about 20 times by the ossicles and the vibrating tympanic membrane. Acoustic energy is transformed from the medium of air to the medium of fluid of inner ear by the middle ear. It is to be ensured that energy is not lost by the impedance matching system.

This impedance matching is accomplished by the area effect of the tympanic membrane and the lever action of the ossicular chain.

The vibratory area pars tensa of the tympanic membrane is 45mm^2 (the lower 2/3 of the drum) and the stapes footplate is 3.2 mm^2. The ratio of the vibrating portion of the tympanic membrane to that of the stapes footplate results in a 17:1 amplified in sound energy.[39]

The handle of the malleus is approximately 1.3 times longer than the long process of incus. The force (pressure) per unit area due to the lever action of the ossiclular chain is more than that at the malleus by about 1.3:1.The combined transformer ratio of the middle ear is about 22:1 (17 x 1.3 = 22). This translates to approximately 25 dB.[40] Quinn FB et al 2003.

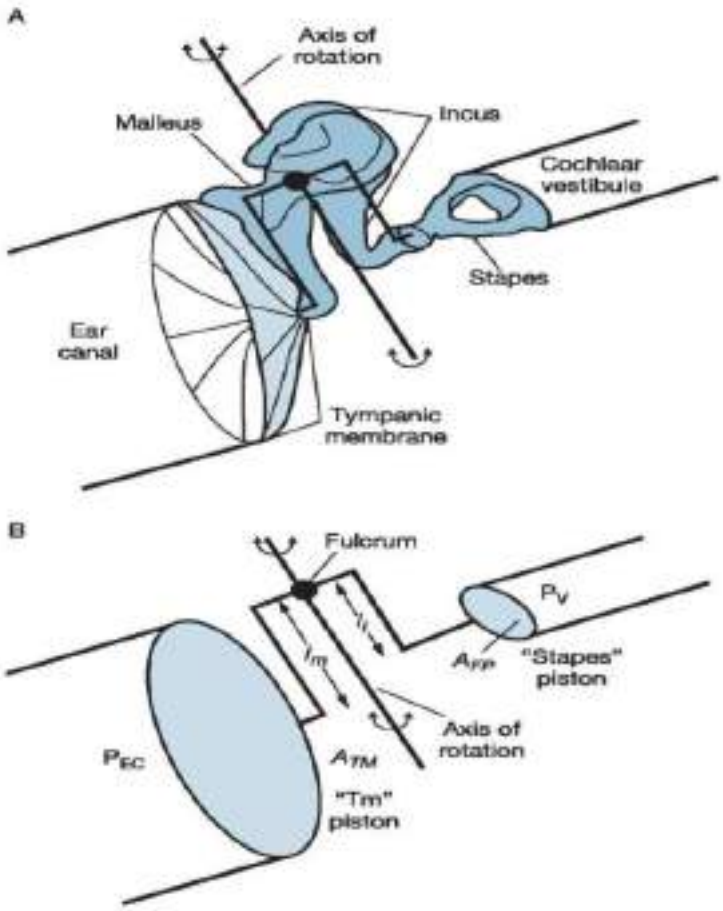


Fig.9: AMPLIFICATION BY LEVER EFFECT OF THE OSSICULAR CHAIN. [41]

C) AUDIOLOGICAL ASPECTS-

The external auditory canal amplifies sound that reaches the tympanic membrane, it functions for relatively short wavelength i.e those in the frequency range between 20 to 20000 hertz.[42]

The dynamic range of hearing covers approximately 130 dB in the frequency region in which the ear is most sensitive between 500 to 4000 Hz. [43]

Pure tone audiometry is the first quantitative hearing evaluation carrued out to assess the nature and degree of hearing loss. This is based on audiometric zero, or the normal hearing, across a defined frequency range. The basic audiological assessment focuses on pure tone air conduction thresholds in the frequency range of 250 – 8000 Hz.[44,45]

In children age between 6 months and 2 years, visual reinforcement audiometry is used. In the perforated tympanic membrane hearing loss is not more tham 50dB. In the intact tympanic membrane with ossicular discontinuity, hearing loss is upto 60db. Exploratory tympanomy is undertaken in these patients.[46-48]

WHO GRADES OF HEARING IMPAIRMENT (2008)

0-25 NO IMPAIRMENT

26-40 SLIGHT IMPAIRMENT

41-60 MEDERATE IMPAIRMENT

61-80 SEVERE IMPAIRMENT

81< PROFUNDE IMPAIRMENT

D) PATHOLOGICAL ASPECT

Damage to the tympanic membrane is primarily the sequale of chronic ear disease, However traumatic etiologies are

1. Direct physical injury
2. Burns
3. Scalds
4. Pressure effects
5. Head injuries

6. Iatrogenic trauma by inserting the ventillatory tube can also occur.

Most of the perforations heal spontaneously within 2 months such as those caused by trauma and acute suppurative otitis media.[49] Active intervention includes topical application of substances like epidermal growth factor, enoxaparin and ascorbic acid to stimulate epithelizationfor early healing and closure and to prevent sclerotic plaque to be formed.[50-52]

There is higher incidence of otitis media between the age of 6 to 24 months and there is recurrence in 40% children by the age of 7 years.[53,54] Hundreds pf bacteria and viruses resides in the nasopharynx and acts as a reservoir of bacteria causing otitis media. Streptococcus and haemophilus influenza are the most common organisms. In 90% cases viral upper respiratory tract infection by S. pneumonia and H. influenza facilitate this commensals into pathogenic state.[55,56] Shambaugh described that acute suppurative otitis media leads to tympanic membrane perforation, who noted toxins from beta hemolytic streptococcus were capable of rapid necrosis of the tympanic membrane.

Chronic otitis media is one of the most common otological diseases in the developing world. CSOM is defined as the persistent infection or inflammation of the middle ear and mastoid air cells. It typically involves a perforation of the tympanic membrane with intermittent or continuous otorrhea. This condition increases the likelihood of cholesteatoma formation.[57] Middle ear disease is the primary cause of hearing loss in children and has a significant impact on language development and academic performance.[58]

E) SURGICAL ASPECTS-

Myringoplasty is the surgical reconstruction of the tympanic membrane.

Tympanoplasty is the surgical reconstruction of the tympanic membrane and the ossicular chain.

Tympanoplasty was advocated in 1950 by Zollner and Wullstein. Since then different techniques have evolved for repair of the tympanic membrane. [59-62]

Tabb and Shea first suggested the medial positioning of graft to malleus and residue of the tympanic membrane.[63-65]

The term “tympanoplasty” was coined by Wullstien 1953 to describe surgical reconstruction of the middle ear hearing mechanism.

Wullstein classified five different types of tympanoplasties and described it in 1956.[66]

Type I-

Repair of tympanic membrane only when the middle ear is normal. It is synonymous with myringoplasty.

Type II-

Reapir of the tympanic membrane and middle ear when there is slight defect in middle ear ossiclea.

Type III-

Removal of ossicles and epitympanum when there is large defect of malleus and incus. In this the tympanic membrane is repaired and directly placed over the head of the stapes.

Type IV-

It describes the repair when crura are missing but foot plate of stapes is moveable. In this middle ear only has Eustachian tube and hypotympanum.

Type V-

It involves repair of fixed stapes foot plate.

Various tissues have been used for grafting the tympanic membrane since the establishment of tympanoplasty.

In 1956, Zollner used fascia lata to close the perforation.[67]

Ortegrel 1958-59, Heermann 1961, Storrs 1961 was first time used temporalis fascia graft.Shea and Tabb 1960, used the vein graft for the closure of tympanic membrane perforation. [68]

The tympanic graft tissue is classified as:

Xenografts/Heterlogous- harvested from different species (pig, sheep)

Autografts/Autogenous – harvested from the same person

Allografts/Homogenous - harvested from the different person

- **AUTOGENOUS GRAFTS**

Autogenous grafts are the most popular grafts easily available don‘t have immunological problems, are inexpensive, and there is no risk of HIV infection.

These include:

a. Temporalis muscle fascia
b. Tragal Perichondrium
c. Conchal Perichondrium
d. Tragal or conchal cartilage
e. Fatty tissue
f. Fascia lata from thigh
g. Periosteum
h. Subcutaneous tissue
i. Vein
j. Ear-canal skin
k. Heterotopic skin (skin from distant site)

The temporal fascia is superior to other grafting material because of :

1. Low basal metabolic rate
2. Low elasticity
3. Same texture as of original tympanic membrane
4. Easy availability and in proximity to the surgical site

Graft uptake is 87% with temporal fascia as compared to perichondrium 86% and vein 50%. Strahan et al; 1971. [69]

ALLOGENOUS GRAFTS

Allogenous Grafts are harvested from another person.

Amnion	Wullstein 1952
Cornea	Holewinski 1958
Dura	Preobrazhenski 1961
Peritoneum	Birch 1961
Pericardium	Trombetta 1963
Aorta valves	Cornisch 1965
Large veins	Nickel 1963
Perichondrium	Jansen 1962
Cartilage	Jason 1963
Fascia	Hild-mann and Steinbach 1970

Tympanic membrane is accessed by three primary approaches namely

1. Transmeatal
2. Endaural
3. Postauricular. [70]

In the transmeatal approach sometimes meatoplasty is needed to access the anterior recess area particularly in the anterior perforation or subtotal perforations. [71]

The universally accepted reconstruction modalities of tympanic membrane repair are

1. The underlay graft technique
2. Overlay graft techniques

1. THE UNDERLAY GRAFT TECHNIQUE-

- Technique-

This technique was described by Shea. The underlay technique is widely used and is relatively simple to perform as the graft is placed

entirely medial to the remaining drum (or annulus) and manubrium of malleus. [72]

Glasscock1973 first report this technique.

- **Advantage-**

This technique is ideal to repair small and easily visualized perforations, blunting and lateralization of the graft are avoided, the drum heals at the correct level relative to the annulus and the ossicles and it is quick and easy to perform.[73]

- **Disadvantage-**

The disadvantages are that the middle ear space is reduced and adhesions occur leading to medialization or atelectasis, There is increased failure due to limited bed size for the graft with a poor vascularity. Exposure of the middle ear is relatively limited and it is not the ideal technique for perforations extending into the anterior annulus since placement of the graft is difficult. [74]

Modification-

Some times a hole is made in the fascial graft in order to fit it into the handle of malleus. Tip of the handle of malleus is passed through the hole and then stretched all around the neck of the malleus. [75]

2. OVERLAY GRAFT TECHNIQUE-

The overlay technique is more challenging and typically reserved for total perforations, anterior perforations, or unsuccessfull underlay surgery. [76]

- **Technique-**

In this technique graft is placed lateral to the tympanic annulus and the manubrium. [77]

- **Advantage-**

Overlay technique is good for all types of perforations and helps to preserve the volume of the middle ear. [78]

- **Disadvantage-**

Blunting of the anterior angle leads to associated conductive hearing loss and formation of epithelial pearl.

The other surgical techniques include

3. **Loop overlay tympanoplasty** [79]

It is a modified overlay technique in which flap is raised antero superiorly in cases of anterior, subtotal or total perforation.

Heung-Yeup Lee 1, Hyeon-Jin Auo, Jun-Myung Kang in a retrospective study from march 1998 to feb 2007 concluded The loop overlay graft method is a safe and effective technique for reconstruction of anterior, subtotal or total TM perforations.

4. **Sandwich graft tympanoplasty** [80]

It is the combination of the underlay and the overlay grafting technique. Jay B Farrior MD first describe this technique in 1983.

5. **Over-under tympanoplasty** [81]

Jack M Kartush 1, Elias M Michaelides, Zoran Becvarovski, Michael J LaRouere conducted a study on 120 patients and tympanoplasty is performed by placing graft under the annulus and over the handle of malleus.

6. **Mediolateral graft tympanoplasty** [82]

In this technique posterior half of the graft is placed medial and anterior half is placed lateral to the annulus. In a retrospective study of 100 patients Timothy T K Jung 1, Seong Kook Park found this technique is very good for the reconstruction of large anterior or subtotal perforation.

7. **Gelfilm sandwich tympanoplasty**[83]

In this technique gelatin film sheets are used to frame fascia graft

8. **Crown cork tympanoplasty**[84]

In this technique autologous tragal graft is taken. Cartilage faces to the middle ear and the overflaping perichondrium is layed on the bony

canal wall in a manner of crowncork. J Hartwein 1, R M Leuwer, W Kehrl found this technique usefull in ear malformation cases.

9. **Swinging door tympanoplasty**[85]

In this technique fascia graft is placed over the anterior fibrous annulus but medial to the handle of malleus then draped up posterior canal wall. So Young Park, Hyuk Jae Lee, Myung Joo Shim, Dong Kee Kim, Byung Do Suh found this technique gives good results in large anterior quadrent perforations.

10. **Laser assisted spot welding technique**[86]

In this technique laser is used to secure the periosteal graft in place in an underlay fashion. L H Escudero, A O Castro, M Drumond, S P Porto, D G Bozinis, A F Penna, E Gallego-Lluesma in there study they describe how laser is usefull in ctrolling bleed from micro vessels and to spot welf the graft with the flap.

11. **Microclip technique** [87]

In this technique 1mm 'microclips' are used to secure the graft to the bed. J D Williams in his study on 404 cases describe the use of microclips to secure the graft in place.

12. Facial pegging[88]

13. **Annular wedge tympanoplasty**[89]

In this technique anterior edge of graft is secured by tucking it into the created wide annular pocket. R Albera 1, V Ferrero, G Canale from January 1993 to July 1994 performed 74 tympanoplasties using annular wedge technique.

14. Paper patching, double fat graft and the self-stabilizing tympanic membrane patchers[90]

The concept of placing the graft lateral to the handle of the malleus in underlay technique have advantages and these are -

1. Better acess to the antero superior part of the middle ear
2. Its easier to place a gelfoam between the handle of malleus and promontory

3. It is a good alternative to conventional underlay technique with perforation or other significant disease involvingthe area anterior to the malleus handle.[91]

The concept of cortical mastoidectomy-

In 1700s Robert A Battista et al, Louis Petil 1700s first described the procedure of cortical mastoidectomy but it didn‘t gained acceptance until 1958, and was later popularized by William House. Primary role of mastoidectomy is to improve the ventilator system of middle ear and mastoid air cell system.

The impact of pressure changes by the middle ear is well buffered by the well aerated mastoid air cells. Holmquist, Bergstrom 1978,Sade et al, Richards et al 1992.[91,92]

There is no significant difference between the success rate of graft uptake between the tympanoplasties with or without cortical mastoidectomy in dry and discharging ear. Conclusion was that even in discharging ear, mastoidectomy is not helpful in tympanoplasty for non cholesteatomatous chronic otitis mediaMishiro Y et al 2001.[93]

In the series of patients, the underlay or overlay positioning of a graft achieves successful outcome for both repair of perforation and hearing function, with better hearing gain in the underlay group. in myringoplasty, the two most common techniques for positioning the graft relative to the remnant of both the tympanic membrane and the annulus are the “overlay” and the “underlay” techniques. 115 patients who underwent myringoplasty for tympanic membrane perforation secondary to chronic otitis media and/or trauma were included, and hearing function was evaluated. We prefer an overlay technique in subtotal perforations, in those involving the anterior and antero-inferior parts of the ear drum with respect to the handle of the malleus and in revision surgery. We reserve an underlay technique for smaller perforations and for those limited to the posterior part of the tympanic membrane. of 115 cases, 63 underwent an overlay myringoplasty and 52 underlay myringoplasty. in the former group,

five cases were anatomically unsuccessful, whereas in the second group there were three failures. The air bone gap improved significantly in both groups with a better hearing gain in the underlay group.[94]

The graft-take rates in both groups were successful. This both methods i.e graft placed medial or lateral to the handle of the malleus has a high rate of success for the closure of large TM perforations with significant improvement in air bone gape.[95]

Robert and colleagues examined the risk factors of re-perforation following Myringoplasty surgery. They analyzed the impact of such factors such as age, sex, ear discharge, status of the opposite ear, hearing loss and surgical approach and technique on the results of Myringoplasty. Based on a statistical analysis, they finally introduced surgical technique as the more effective factor on the final results of Myringoplasty.[96]

Hosney and colleagues studied the outcome of myringoplasty in wet and dry ears and found that there was no statistically significant difference between wet and dry ears in graft taking and hearing improvement. [97]

A retrospective study of 423 myringoplasties carried out to compare if size of the perforation affects the outcome of myringoplasty showed that size does influence success; the success rate for small perforations was 74.1% compared with 56.0% for large perforations (P = 0.0003).[98]

A comparative study of graft placed medial or lateral to handle of malleus in tympanoplasty was conducted and results of the two techniques were compared in terms of graft take-up rate, hearing improvement and complications at the end of 6month follow-up. The graft take-up rate and post operative gain in air conduction in group A was 91.30%, 3.57+/-6.61 dB (mean+/-SD) respectively and it was 96.55%, 6.62+/-6.86dB (mean+/-SD) respectively in group B (p value is >0.05). Which were statistically analysed by Chi-square and T-test. Conclusion- there is no difference in graft take-up rate, gain in hearing or complications in both the techniques, in consideration of the duration of surgery,

technicality and healing, placement of graft lateral was found to be better than medial to the handle of malleus in modified inlay technique of myringoplasty.[99]

Two hundred patients with chronic otitis media, tubotympanic disease, inactive stage who underwent tympanoplasty by the 360 degree subannular technique between the years 2009 to 2013 were selected for the study as and when they were admitted. All the patients were followed up for 6 months following surgery. Any complications like secondary infection, wound dehiscence, granulations, were looked for and treated appropriately. Status of the neotympanum was evaluated at the end of 3 months. Any anterior blunting, medialisation or lateralisation of the graft was noted. Any residual perforation was considered as failure. Hearing was evaluated in all patients with an intact neotympanum. Study showed an overall success rate of 96% as far as graft uptake was concerned. Hearing improvement was seen in 93% of our patients. 6 patients had complete air bone gap closure, 49 had AB gap of 10db or less, 131 had AB gap of 11-20db. 14 patients had no improvement in hearing. Overall hearing improvement was seen in 93% of our patients. In conclusion 360 degree sub-annular tympanoplasty is a efficient technique of tympanoplasty with very good results.[100]

Other study to compare tympanic membrane grafting medial or lateral to handle of malleus contained 28 patients in Group A and 28 in Group B. Overall success rate was 94.64% that was 96.42% in Group A, and 92.85% in Group B. Differences of air-bone gap in each group before and after surgery was 16.10 (±4.89) in Group A, and 15.78 (±3.40) in Group B. Improvement of hearing level was not significant between two surgical methods (P = 0.442).

This study shows Both techniques (medial and lateral to malleus handle) of TM grafting are effective with success rates 96.42% and 92.85% respectively.[101]

Another study with 302 patients with chronic otitis media, 114 who had a perforation that involved over 50 % of the pars tensa were enrolled in the study. The underlay technique was used in 61 patients, and the over-underlay technique in 53 patients. In the underlay group, the preoperative mean perforation size was 30.11 ± 5.35 mm (2) (range 20.00-52.00 mm(2)) (n = 61). In the over-underlay group, the preoperative mean perforation size was 31.41 ± 8.65 mm (2) (range 22.00-48.00 mm(2)) (n = 53). The graft success rate of tympanoplasty performed using the underlay technique was 89.1 % in 61 patients. Seven (10.9 %) patients had graft failure. The graft success rate with the over-underlay technique in 53 patients was 90.5 %. Five (9.5 %) patients had graft failure in this group. Three graft lateralizations (5.6 %) and two retractions (3.8 %) were observed at 12 months postoperatively in the over-underlay group. However, in the underlay group, no graft lateralization but five retractions (8.2 %) were observed at 12 months.[102]

One hundred forty-one tympanoplasties were analyzed. In the early postoperative period, 140 (99%) of 141 grafts were intact and, at a mean of 32.1 months, 121 (85.8%) remained without significant retraction or reperforation. There were no cases of early or delayed graft lateralization. The mean preoperative and most recent postoperative air-bone gaps were 23.7 dB and 14.1 dB, respectively ($p < 0.001$). Surgery was not associated with a transient or long-term bone conduction threshold shift. Conclusion was that The LMUT technique offers improved exposure of the tympanic space and a low rate of graft failure. The risks of sensorineural hearing loss with ossicular chain manipulation and tympanic membrane lateralization from graft placement lateral to the malleus are very low.[103]

A study to compare between underlay and over underlay technique of tympanoplasty was conducted and In group I, 25 (83.3%) patients had a full take of the graft at the 3-month follow-up. In group II, 27 (90%) patients had a full take of the graft at the 3-month follow-up. These patients did not develop severe graft lateralization, infection or blunting (p 0.7). In group I,

the hearing improvement or the decrease in air bone gap is by 11±7.2db while in group II, the improvement of hearing or decrease in air bone gap is by 12.2±7db (p 0.52).There were high success rate of graft up take and considerable hearing improvement in both techniques of myringoplasty. No statistically significant difference in both the techniques was proved.[104]

An other study to compare over underlay grafting with conventional underlay grafting myringoplasty was conducted in which Graft uptake and hearing improvement was comparable in both groups. Although the graft uptake was 5% lower in the group which underwent conventional underlay myringoplasty (90%) as compared to over-underlay myringoplasty (95%), however, the difference was not statistically significant (P = 0.5). However, there was statistically significant difference in gain in hearing threshold (gain in A-B gap) in the conventional underlay myringoplasty (14.5 dB ± 7.236) as compared to over-underlay myringoplasty (18.75 dB ± 5.349) (P = 0.04). Conclusion: The over-underlay technique, which is a hybrid of both overlay and underlay technique, allows the advantages of both methods. It improves the graft uptake rate and hearing in subtotal and large perforation.[105]

In an other study conducted at Dayanand Medical College and Hospital, 80 cases were taken up for the study. Pre-operative assessment of the Eustachian tube function using a Passive Eustachian tube function test "The Forced response test" and the results of tympanoplasty in safe Ch. SOM. Adhesive Otitis Media and Posterosuperior inpouching cases have been mentioned in this study. However multiple factors are considered for the outcome of myringoplasty or tympanopasty but it also depends upon the Eustachian function.[106]

MATERIALS AND METHODS

STUDY DESIGN

A prospective study of two different techniques of tympanoplasty were undertaken. 50 patients with diagnosis of safe Chronic Suppurative Otitis Media/ tubo-tympanic/mucosal disease were selected from ENT outpatient department of Dayanand Medical College & Hospital Ludhiana. The study conducted for a period of 1.5 years i.e from 1st November 2018 to 31st April 2020. All the patients fulfilled the standard criteria for tympanoplasty. A proper work up was carried out as per the requisite performa. Malleus medialisation and lateralisation tympanoplasty was carried out. Patients were followed up for evaluations, graft uptake, the hearing status and any complications.

7.2. METHODOLOGY

INCLUSION CRITERIA

Patients with –

i. Safe chronic suppurative otitis media
ii. All age groups
iii. Either gender
iv. Non discharging ear

EXCLUSION CRITERIA

1. Patients with unsafe chronic suppurative otitis media
2. Any other external or middle ear pathology such as.

a) Otitis externa

b) Ear canal stenosis

c) Ear trauma

d) persistent or recent upper respiratory tract infection

e) Revision tympanoplasty

3. Head trauma
4. Sensory neural hearing loss

The patients were worked up according to the protocol mentioned in the performa. This included, besides gross general physical examination to

evaluate foci of infection in oral cavity, oropharynx, nasopharynx. The outpatient evaluation covered

1. Head mirror / otoscopic examination
2. Examination under microscope (EUM) / Telendoscopy
3. Tuning fork tests (512Hz)
4. Pure tone audiometry
5. Radiology- a)X-Ray mastoids b) x-ray paranasal sinuses
6. Electronystagmography if need be.

Audiological Assessment- (WHO grades of hearing impairment 2008) Pure tone audiometry- Pure tone average hearing thresholds were calculated for each patient at 500, 1000, 2000, 4000 and 8000HZ. Normal hearing sensitivity was defined as hearing threshold of less than 25dBHL at each frequency tested within the range of 0.25 to 8 kHz.

RADIOGRAPH MASTOIDS AND PARANASAL SINUSES- (Law's view) X-RAY mastoids (wherever required) was done to asses the type of pneumatisation, sclerosis and any anatomical anomalies such as anterior lying sigmoid sinus and low lying dura.

X ray para nasal sinuses water's view to evaluate any underlying sinusitis if any.

DURATION OF STUDY / NUMBER OF CASES-

The study was performed on patients coming to ENT OPD during the period from

Nov 2018 to April 2020. Our study was based upon the handle of malleus medialisation and lateralization tympanoplasty.

SURGICAL OUTCOME w.r.t-

iii. Graft uptake
iv. Position of graft
v. Mobility of graft

AUDIOLOGICAL OUTCOME w.r.t-

i. AB gap shift- shift in AB gap as compared to pre-operative gap.

ii. Hearing improvement- hearing gain was labeled when there was improvement/shift in speech frequencies i.e in mean pure tone average as compared to pre-operative.

STATISTICAL ANALYSIS:

Data will be described in terms of range; mean ± standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages)as appropriate. Comparison of quantitative variables between the groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test will be used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 17 version statistical program for Microsoft Windows.

THE SURGICAL PROCEDURE:

Pre op preparation-

Hair surrounding the ear to be operated was shaved off about 1-1$^{1/2:}$ inch and the surrounding areas was cleaned with povidine iodine 0.5% and spirit.

Antiseptic dressing was done in all cases on the night prior to surgery in order to enhance local asepsis

Premedication:

The next day the day of surgery premedication with Atropine 0.6 mg and phenargan 25 mg was given half an hour before the commencement of the procedure. For local infiltration 1% Xylocaine with 1:100000 Adrenaline solution was used.

Harvesting of tissue fot reconstruction (Autologous):

i. Temporalis fascia harvested via a) supra auricular incision b) extension of endaural incision (Lempert's type 3)
ii. Tragal perichondrium- incision made over tragus.

The either of the tissue were spread and made clear of the overlying fat to retain the optimal and uniform thickness.

Post operatively the patients were given:

i. Antibiotics (ceftriaxone, amoxicillin)
ii. Anti histamines (Ebastin, montelukast, cetrizen)
iii. Analgesics (Ibuprofen, paracetamol, diclofenac)

Ribbon gauze pack was removed on the 7^{th} postoperative day. Stitches were removed on the 10^{th} postoperative day.

Post op instructions-

i. Avoid sniffing of nose
ii. Avoid drinking by straw
iii. Avoid lying with operated side down
iv. Avoid rubbing ear especially over suture area
v. Avoid water entry to ear
vi. Avoid self cleaning

Ear examination for graft vascularisation and audiological evaluation was undertaken after four weeks postoperatively. Patients were observed for graft uptake and any complications at four weeks, three months and six months postoperatively. Pure tone audiometry was done respectively. Any factors contributing to failure of graft were also noted.

4^{TH} week evaluation-

i. Surgical – EUM/ Telendiscopy a) graft uptake b)graft mobility c) graft position
ii. Audiological- a) hearing improvement b) AB gap shift

Similarly patients evaluation done on 12^{th} and 24^{th} week.

OBSERVATIONS AND RESULTS

In the present study 50 patients with clinical diagnosis of Chronic Suppurative Otitis Media, who passed inclusion and exclusion criteria were selected for study, from the department of otorhinolaryngology, Dayanand Medical College and Hospital, Ludhiana. The study was carried out from august 2018 to april 2020. The observations have been evaluated as:

A. Pre operatiove profile of the patients taken up for tympanoplasty by either technique- 1) Demographic profile 2) Clinical profile 3)
B. Intra operative profile of the patients taken up for tympanoplasty by either technique- 1) Size of perforation 2) shape of perforation 3) location of perforation
C. Post operative profile of the patients taken up for tympanoplasty by either technique- 1) graft uptake rate 2) hearing gain 3) AB gap shift

A. PREOPERATIVE PROFILE

DEMOGRAPHIC PROFILE

TABLE 1

Age distribution of patients taken up for tympanoplasty

(n=50)

Age group(years)	No. of patients	% of patients
0-20	11	22%
21-30	13	26%
31-40	7	14%
41-50	12	24%
>50	7	14%
Total	50	100%

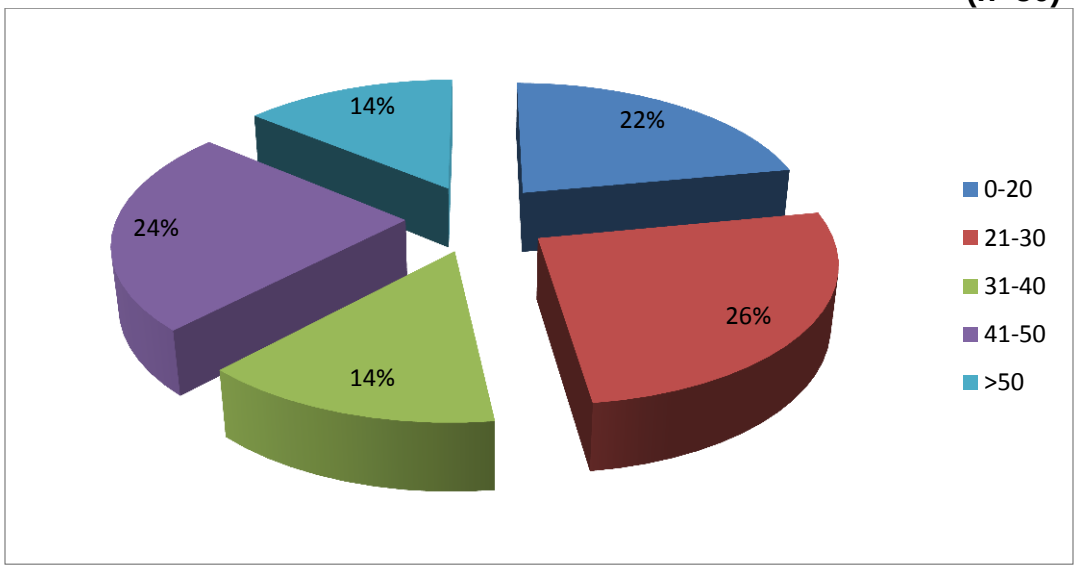
n = no. of patients

Minimum age among these patients was 8 years and maximum age is 66 years. Maximum number of patients are in the age group of 21-30 years 3(26%) followed by 41-50 years12 (24%). Mean age was 34.58.

FIGURE 10

Age distribution of patients taken up for tympanoplasty

(n=50)



n=no. of patients

Minimum age among these patients was 8 years and maximum age is 66 years. Maximum number of patients are in the age group of 21-30 years 3 (26%) followed by 41-50 years 12 (24%). Mean age was 34.58.

TABLE 2

Gender distribution of patients taken up for tympanoplasty

(n=50)

Gender	No. of patients	%of patients
Male	18	36%
Female	32	64%
Total	50	100%

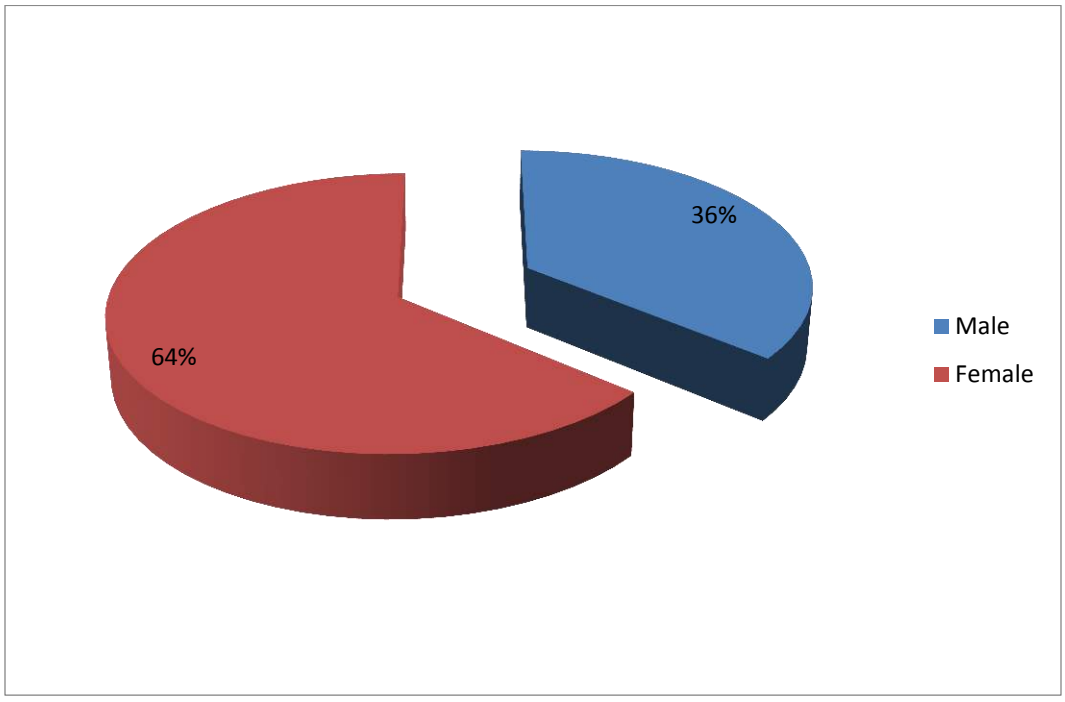
n = no. of patients

There were more 32(64%) than males 18(36%). The females outnumbers in the ratio.

FIGURE 11

Gender distribution of patients taken up for tympanoplasty

(n=50)



n=no. of patients

There were more 32(64%) than males 18(36%). The females outnumbers in the ratio.

TABLE 3

Socio economic status of patients taken up for tympanoplasty

(n=50)

Area	No. of patients	% of patients
Rural	28	56%
Urban	22	44%

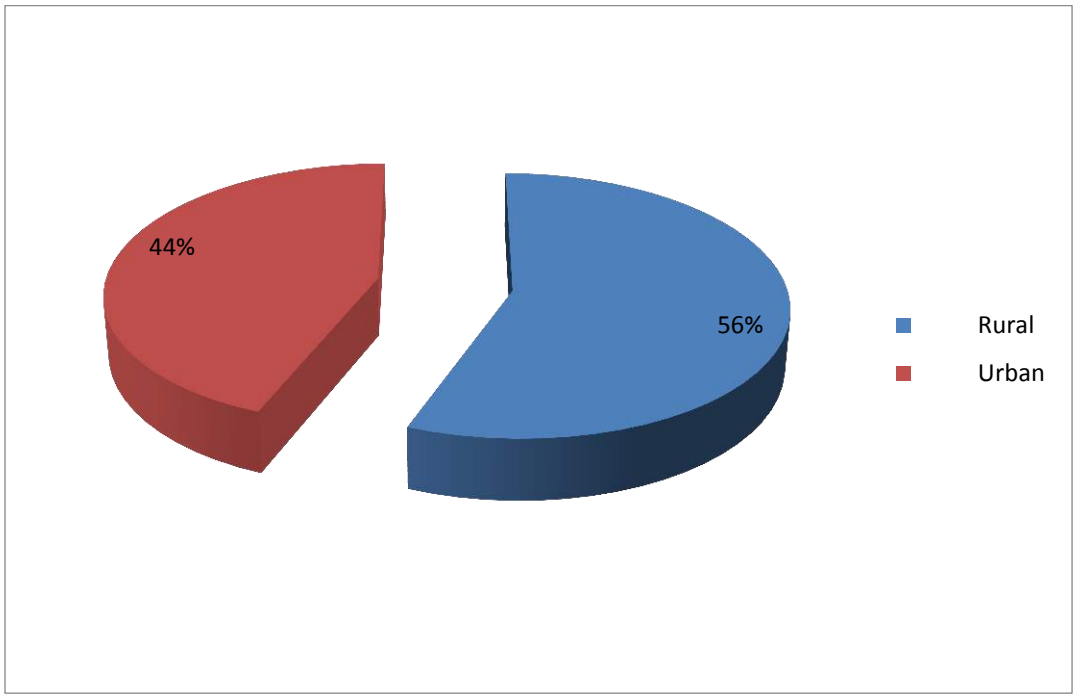
n = no. of patients

28 (56%) patents belongs to rural and 22 (44%) patients belongs to urban background.

FIGURE 12

Socio economic status of patients taken up for tympanoplasty

(n=50)



n=no. of patients

28 (56%) patents belongs to rural and 22 (44%) patients belongs to urban background.

CLINICAL PROFILE

TABLE 4

Chief complaints of patients taken up for tympanoplasty

(n=50)

Chief complaints	No. of patients	% of patients
Otorrhoea	42	84%
Hearing impairment	44	88%
Both	40	80%

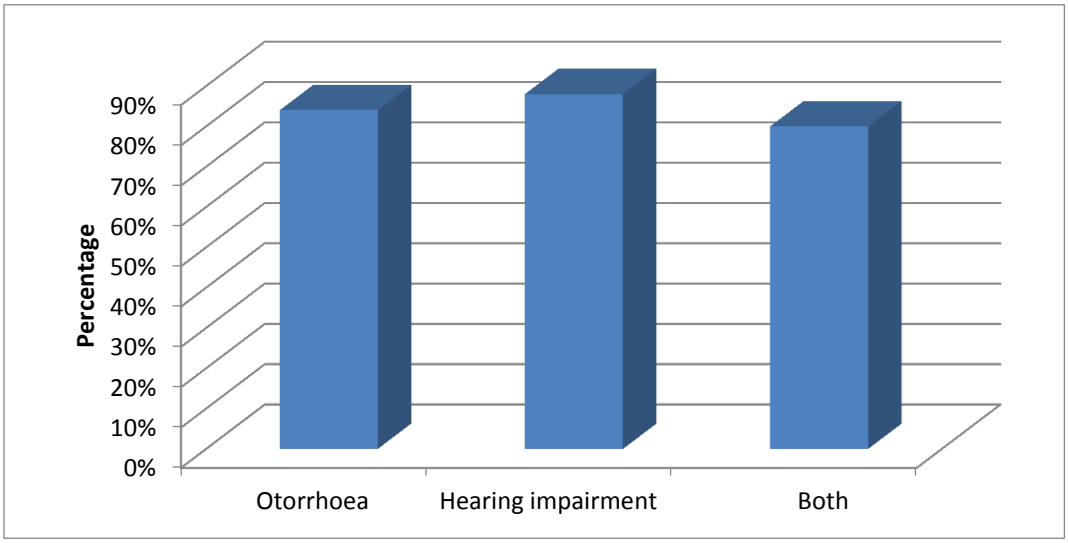
n = no. of patients

All the 50 patients presented with complaint of ear discharge or hearing impairment. 42 (84%) had otorrhoes, 44 (88%) presented with hearing impairment and 40 (80%) had both ear discharge as well as hearing deficit.

FIGURE 13

Chief complaints of patients taken up for tympanoplasty

(n=50)



n = no. of patients

All the 50 patients presented with complaint of ear discharge or hearing impairment. 42 (84%) had otorrhoes, 44 (88%) presented with hearing impairment and 40 (80%) had both ear discharge as well as hearing deficit.

TABLE 5

Discharging ear laterality of patients taken up for tympanoplasty

(n=50)

Discharging ear	No. of patients	% of patients
Bilateral ear	11	22%
Right ear	14	28%
Left ear	17	34%
No discharge	8	16%
Total	50	100%

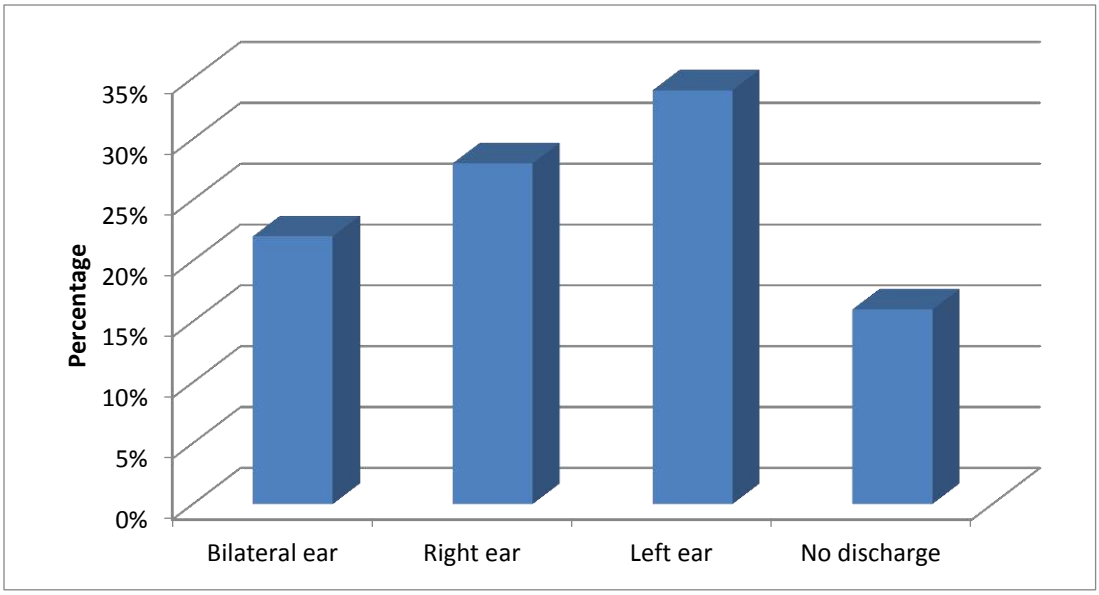
n = no. of patients

In this study 11 (22%) patents had bilateral otorrhoea, 14(28%) patients had right otorrhoea, 17 (34%) had left otorrhoea and 8 (16%) had no otorrhoea.

FIGURE 14

Discharging ear laterality of patients taken up for tympanoplasty

(n=50)



n = no. of patients

In this study 11 (22%) patents had bilateral otorrhoea, 14(28%) patients had right otorrhoea, 17 (34%) had left otorrhoea and 8 (16%) had no otorrhoea.

TABLE 6

Duration of discharge of patients taken up for tympanoplasty

(n=50)

Duration of discharge	No. of patients	% of patients
Less than 1 year	6	12%
1-5 years	23	46%
More than 5 years	13	26%
No discharge	8	16%
Total	100	100%

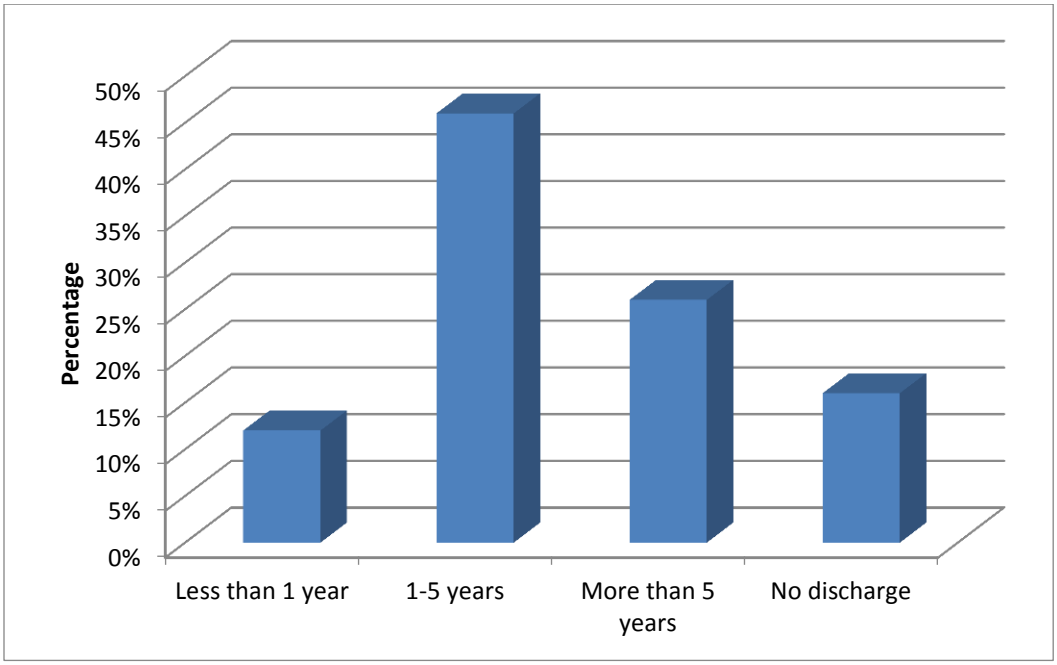
n = no. of patients

Maximum 23 (46%) patients had duration of otorrhoea between 1-5 years and minimum 6 (12%) less than 1 year. In 8 (16%) pateints ear was dry.

FIGURE 15

Duration of discharge of patients taken up for tympanoplasty

(n=50)



n = no. of patients

Maximum 23 (46%) patients had duration of otorrhoea between 1-5 years and minimum 6 (12%) less than 1 year. In 8 (16%) pateints ear was dry.

TABLE 7

Aetiology of perforation of patients taken up for tympanoplasty

(n=50)

Etiology of perforation	No. of patients	% of patients
ASOM	47	94%
Trauma	1	2%
Inconclusive	2	4%
Total	50	100%

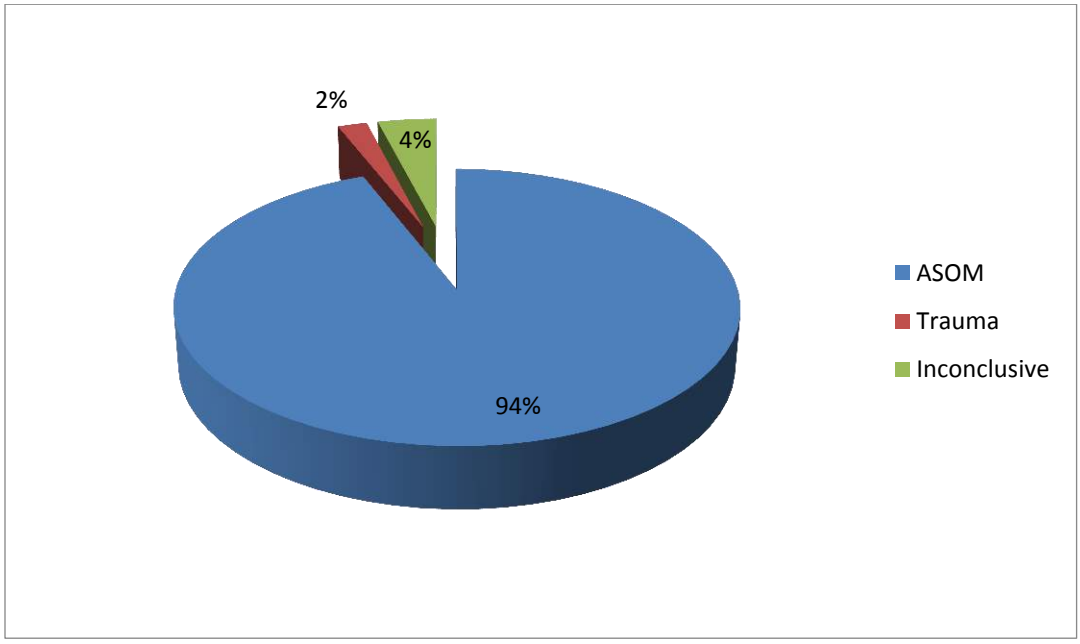
n = no. of patients

Most of the patients 47 (94%) patients had history of acute suppurative otitis media. History of trauma was in 1 (2%) and in 2 (4%) patients there were nothing.

FIGURE 16

Aetiology of perforation of patients taken up for tympanoplasty

(n=50)



n = no. of patients

Most of the patients 47 (94%) patients had history of acute suppurative otitis media. History of trauma was in 1 (2%) and in 2 (4%) patients there were nothing.

TABLE 8 (a)

Antecedent ear drops instillation of patients taken up for tympanoplasty

(n=50)

Ear drops instillation	No. of patients	% of patients
Present	40	80%
Absent	10	20%
Total	50	100%

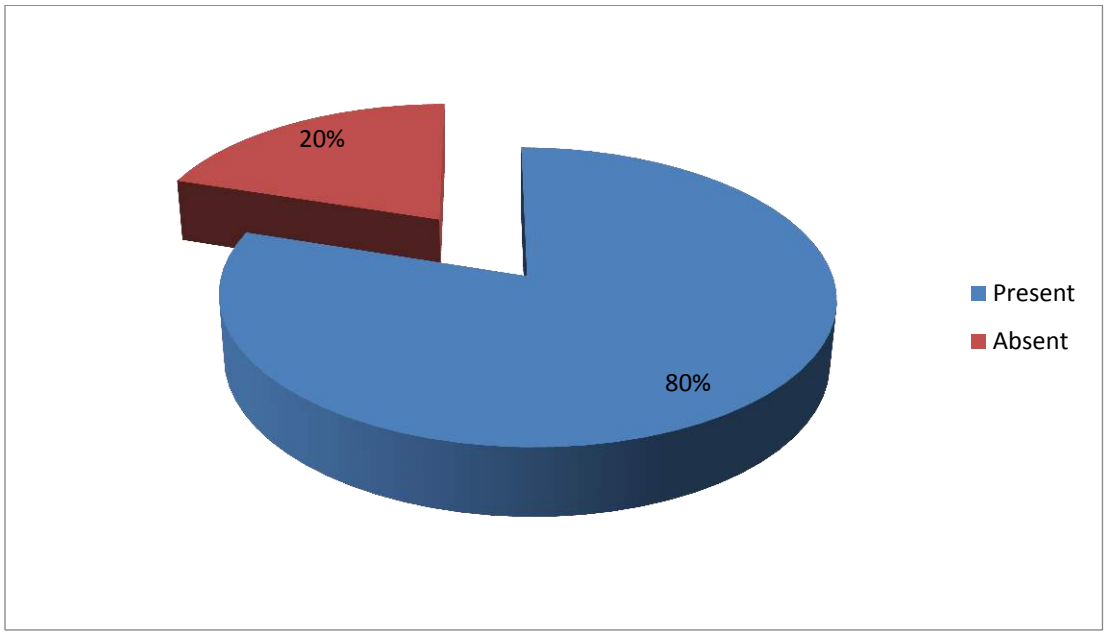
n = no. of patients

40 (80%) patients had history of instillation of ear drops and in 10 (20%) there was no history of any ear drop instillation.

FIGURE 17

Antecedent ear drops instillation of patients taken up for tympanoplasty

(n=50)



n = no. of patients

40 (80%) patients had history of instillation of ear drops and in 10 (20%) there was no history of any ear drop instillation.

TABLE 8 (b)

Salt of ear drops of patients taken up for tympanoplasty

(n=40)

Composition of ear drop	No. of patients	% of patients
Ciprofloxacin	28	70%
Clotrimazole+Ciprofloxacin	8	20%
Polymyxin	4	10%
Total	40	100%

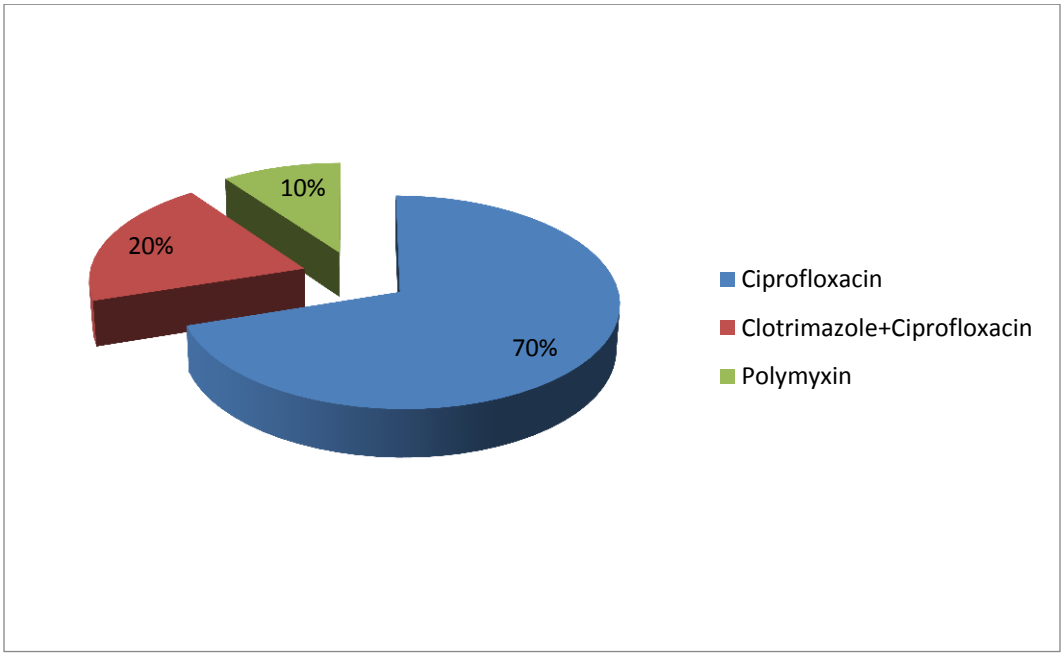
n= no. of patients

40 subjects had history of ear drop instillations.Ciprofloxacin 28 (56%) was predominantly used preparation followed by clotrimazole+ciprofloxacin 8 (16%).

FIGURE 18

Salt of ear drops of patients taken up for tympanoplasty

(n=40)



n= no. of patients

40 subjects had history of ear drop instillations.Ciprofloxacin 28 (56%) was predominantly used preparation followed by clotrimazole+ciprofloxacin 8 (16%).

TABLE 9

Colour of otorrhea of patients taken up for tympanoplasty

(n=40)

Colour of otorrhea	No. of patients	% of patients
Yellow	29	72.5%
Green	3	7.5%
White	6	15%
Blood tinged	2	5%

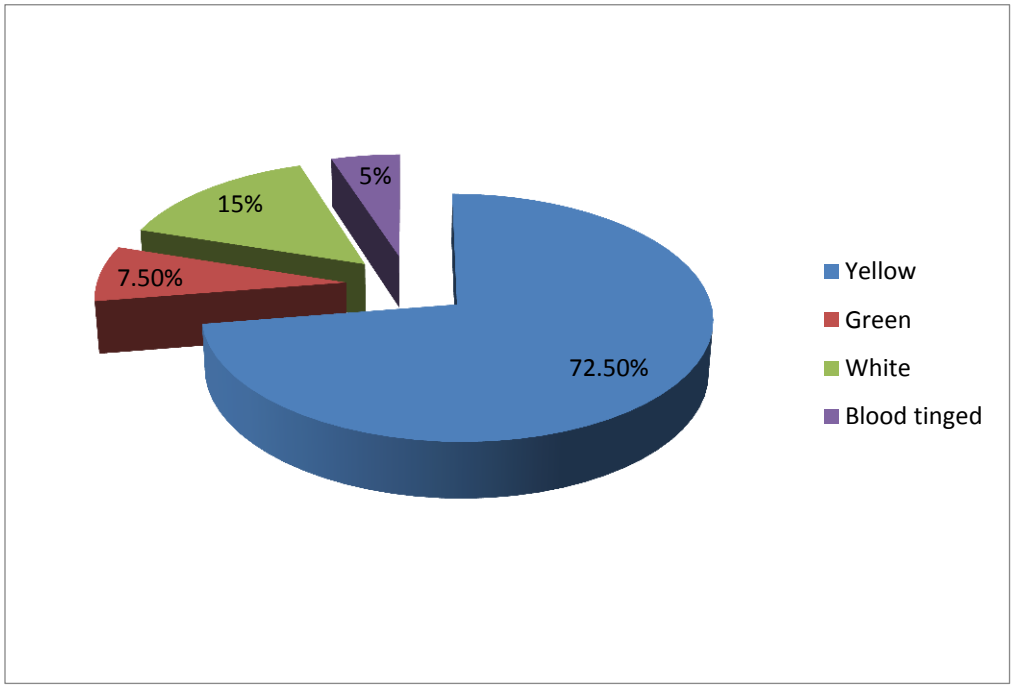
n= no. of patients

29 (58%) patients presented with yellowish, 6 (12%) with whitish, 3 (6%) with greenish and 2 (4%) patients presented with blood tinged discharge.

FIGURE 19

Colour of otorrhea of patients taken up for tympanoplasty

(n=40)



n= no. of patients

29 (58%) patients presented with yellowish, 6 (12%) with whitish, 3 (6%) with greenish and 2 (4%) patients presented with blood tinged discharge.

TABLE 10

Odour of otorrhea of patients taken up for tympanoplasty

(n=40)

Odour of otorrhea	No. of patients	% of patients
Foul smelling	15	37.5%
Non foul smelling	25	62.5%
None	10	25%

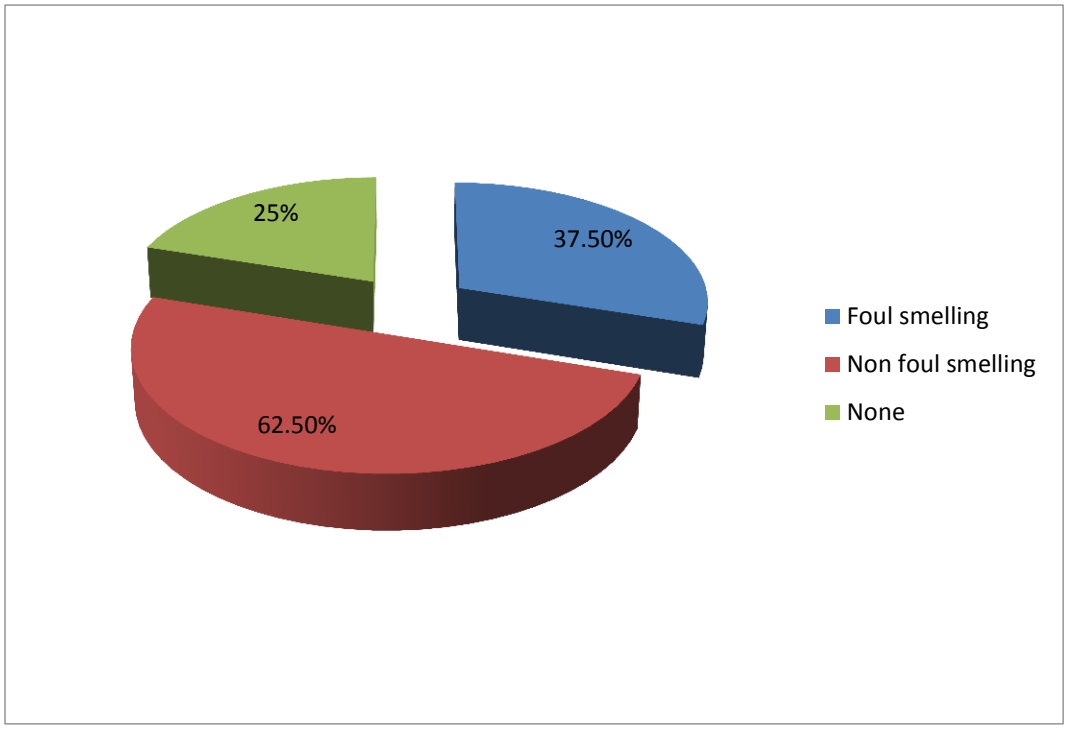
n= no. of patients

25 (50%) patients presented with non foul smelling, 15 (30%) with foul smelling and 10 (20%) with no ear discharge.

FIGURE 20

Odour of otorrhea of patients taken up for tympanoplasty

(n=40)



n= no. of patients

25 (50%) patients presented with non foul smelling, 15 (30%) with foul smelling and 10 (20%) with no ear discharge.

TABLE 11

Consistency of otorrhea of patients taken up for tympanoplasty

(n=40)

Consistency	No. of patients	% of patients
Purulent	14	35%
Mucopurulent	21	52.5%
Mucoid	5	12.5%
Dry	10	25%
Total	40	100%

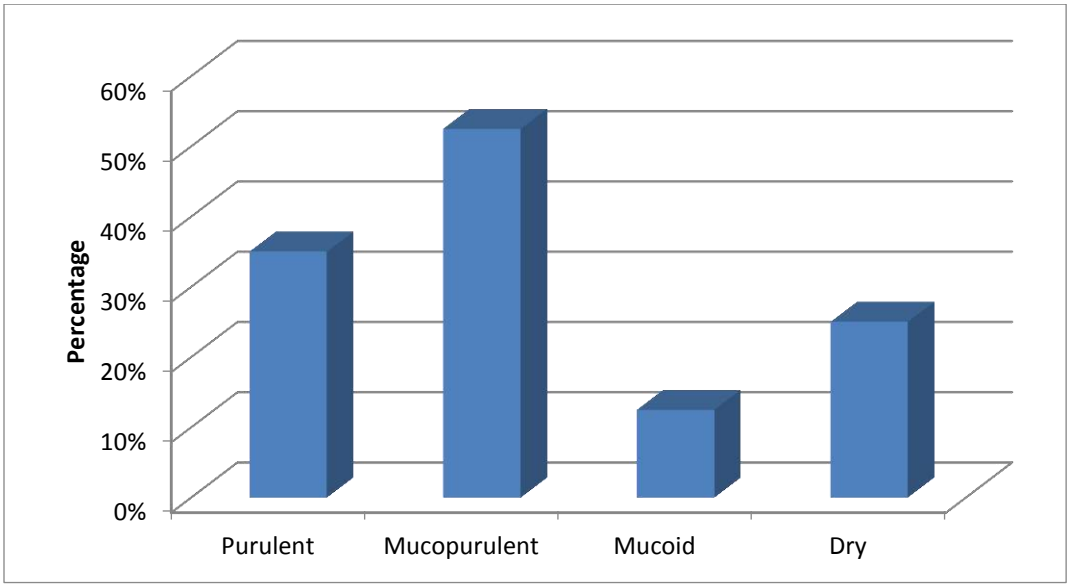
n= no. of patients

21(42%) patients had mucopurulent, 14 (28%) with purulent , 5(10%) had mucoid discharge and 10(20%) patients had dry ear.

FIGURE 21

Consistency of otorrhea of patients taken up for tympanoplasty

(n=40)



n= no. of patients

21(42%) patients had mucopurulent, 14(28%) with purulent , 5(10%) had mucoid discharge and 10(20%) patients had dry ear.

TABLE 12

Culture sensitivity of otorrhea of patients taken up for tympanoplasty

(n=40)

Organism	No. of patients	% of patients
Staphylococcus aureus	**13**	**32.5%**
Streptococcus pneumoniae	**8**	**20%**
Acinetobacter	**5**	**12.5%**
Pseudomonas	**8**	**20%**
None	**6**	**15%**
Total	**40**	**100%**

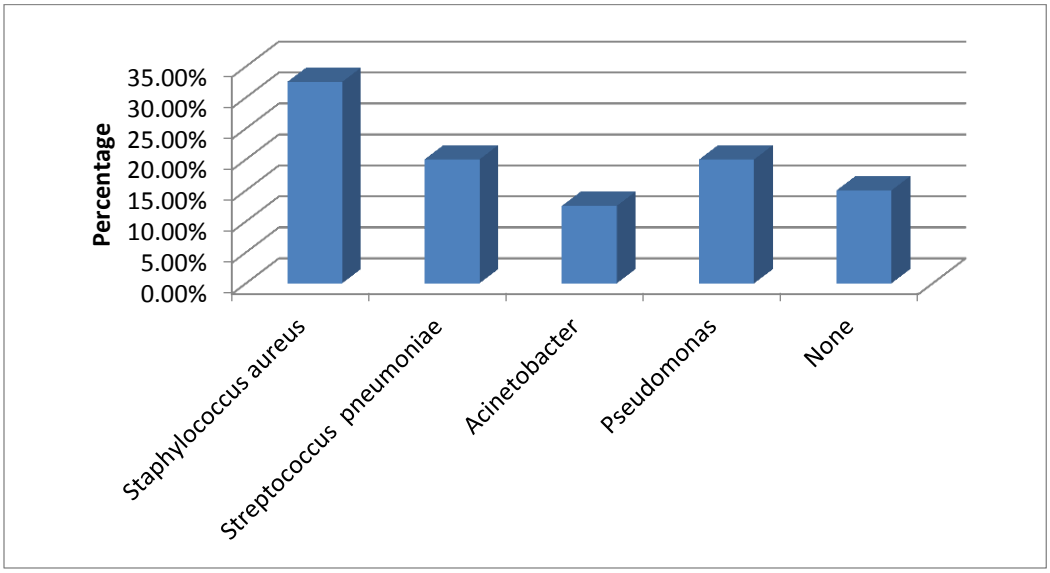
n= no. of patients

Staphylococcus aureus 13 (32.5%), streptococcus pneumoniae, pseudomonas 8 (20%) each acinetobacter 5 (12.5%) and 6 (15%) had no growth on aural swab culture and sensitivity.

FIGURE 22

Culture sensitivity of otorrhea of patients taken up for tympanoplasty

(n=40)



n= no. of patients

Staphylococcus aureus 13 (32.5%), streptococcus pneumoniae, pseudomonas 8 (20%) each acinetobacter 5 (12.5%) and 6 (15%) had no growth on aural swab culture and sensitivity.

B. INTRA OPERATIVE PROFILE

TABLE 13

Size of perforation of patients taken up for tympanoplasty

(n=50)

Size	No. of patients	% of patients
Small	5	10%
Medium	19	38%
Large	19	38%
Sub total	7	14%
Total	50	100%

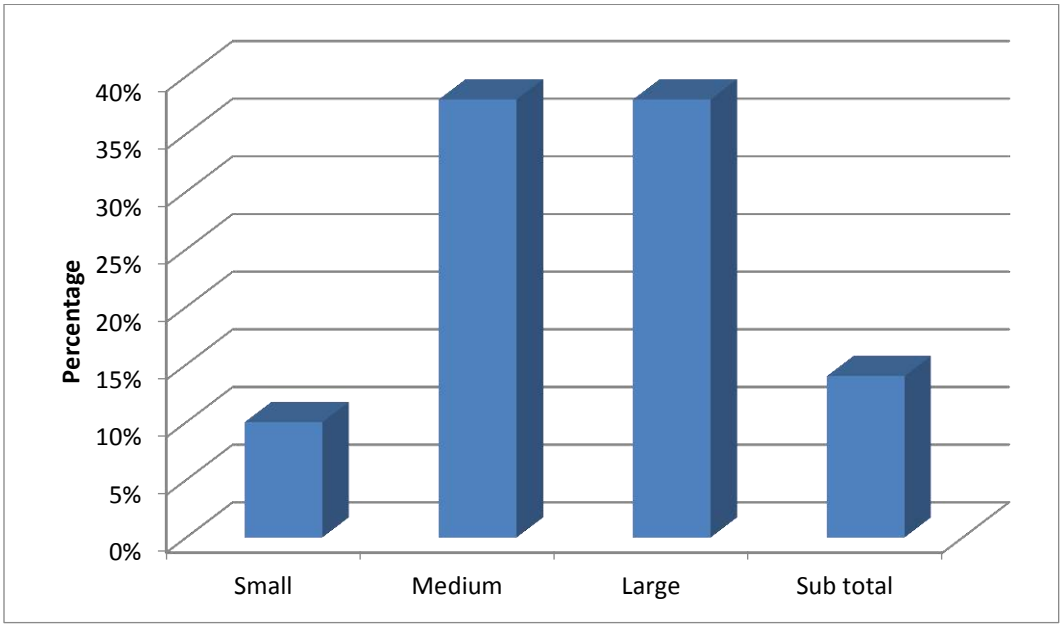
n= no. of patients

Large and medium size perforation in 19(38%) each, 7(14%) had subtotal and 5(10%) had small perforation.

FIGURE 23

Size of perforation of patients taken up for tympanoplasty

(n=50)



n= no. of patients

Large and medium size perforation in 19(38%) each, 7(14%) had subtotal and 5(10%) had small perforation.

TABLE 14

Shape of perforation of patients taken up for tympanoplasty

(n=50)

Shape	No. of patients	% of patients
Kidney shape	13	26%
Oval shape	37	74%
Total	50	100%

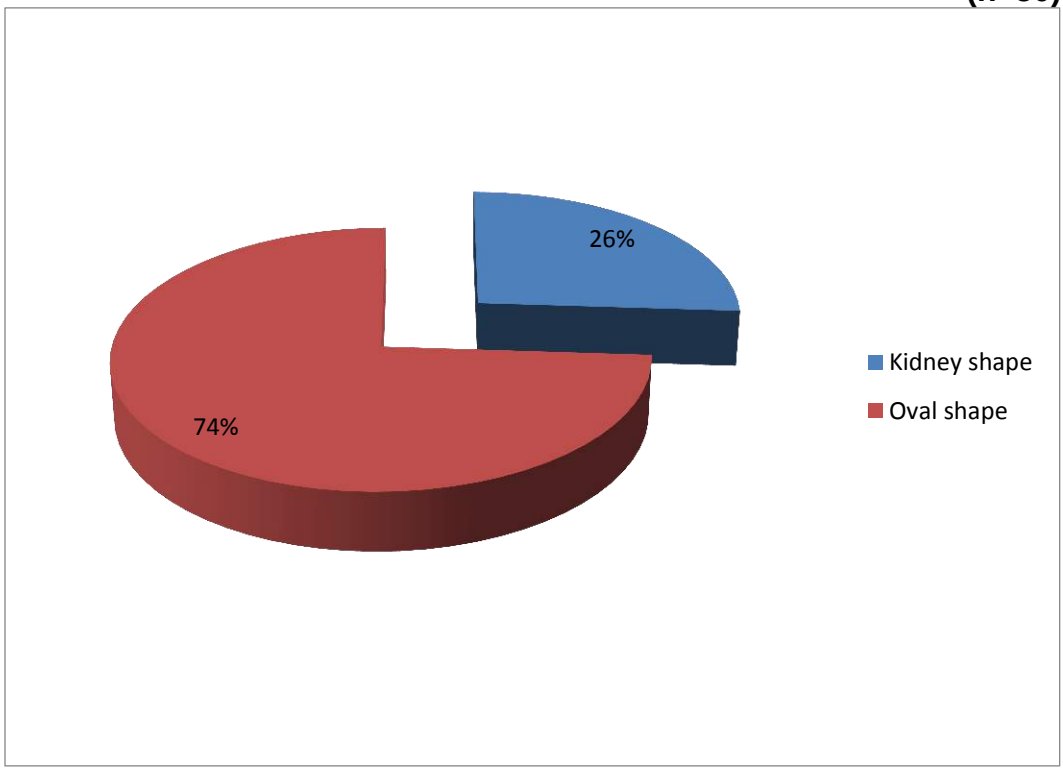
n= no. of patients

Commonest perforation in this study group is oval shape (74%) followed by 26% kidney shaped.

FIGURE 24

Shape of perforation of patients taken up for tympanoplasty

(n=50)



n= no. of patients

Commonest perforation in this study group is oval shape(74%) followed by 26% kidney shaped.

TABLE 15

Visibility of margins of perforation on microscopy of patients taken up for tympanoplasty

(n=50)

Visibility of all margins	No. of patients	% of patients
Present	43	86%
Absent	7	14%
Total	50	100%

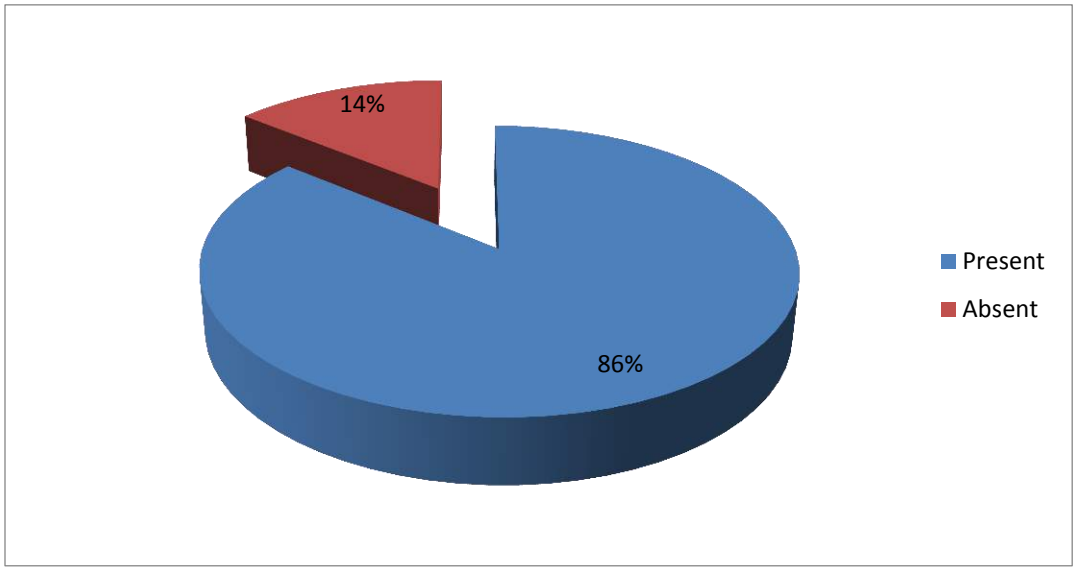
n= no. of patients

In this study group of 50 patients, on microscopic examination, in 43(86%) patents all margins of perforation were seen and in 7(14%) patients all margins were not seen.

FIGURE 25

Visibility of margins of perforation on microscopy of patients taken up for tympanoplasty

(n=50)



n= no. of patients

In this study group of 50 patients, on microscopic examination, in 43(86%) patents all margins of perforation were seen and in 7(14%) patients all margins were not seen.

TABLE 16

Location of perforations of patients taken up for tympanoplasty

(n=50)

Types of perforation	No. of patients	% of patients
Antero-superior	3	6%
Antero-inferior	5	10%
Postero-superior	11	22%
Postero-inferior	21	42%
Subtotal	10	20%
Total	50	100%

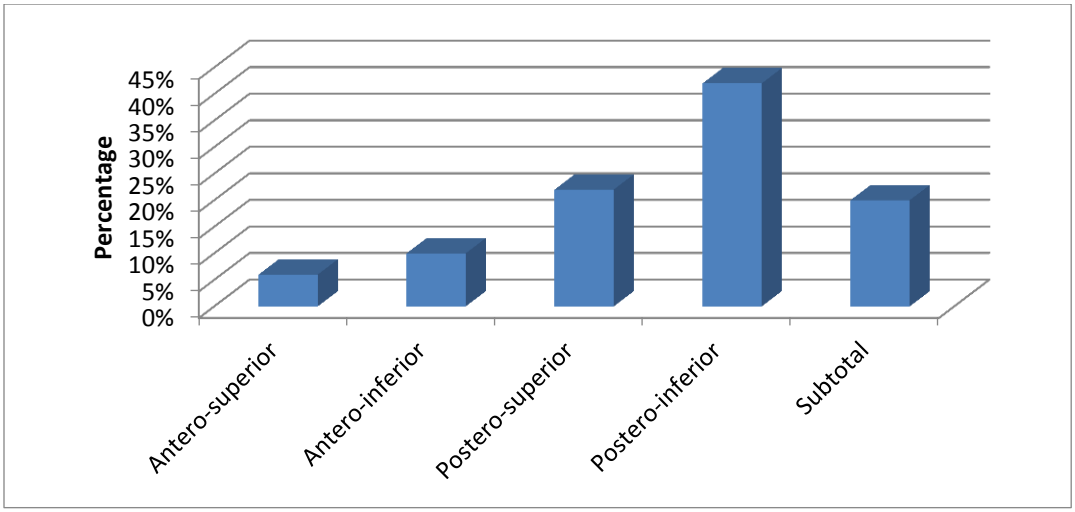
n= no. of patients

In this study majority 21 (42%) of perforation was in the poatero-inferior quadrent, followed by postero-superior quadrent 11 (22%), subtotal in 10(20%), antero-inferior in 5(10%) and only 3 (6%) seen in antero superior quadrent.

FIGURE 26

Location of perforations of patients taken up for tympanoplasty

(n=50)



n= no. of patients

In this study majority 21 (42%) of perforation was in the poatero-inferior quadrent, followed by postero-superior quadrent 11 (22%), subtotal in 10 (20%), antero-inferior in 5(10%) and only 3 (6%) seen in antero superior quadrent.

TABLE 17

Granuloma on perforation margins of patients taken up for tympanoplasty

(n=50)

Granulations over margins of perforation	No. of patients	% of patients
Present	4	8%
Absent	46	92%
Total	50	100%

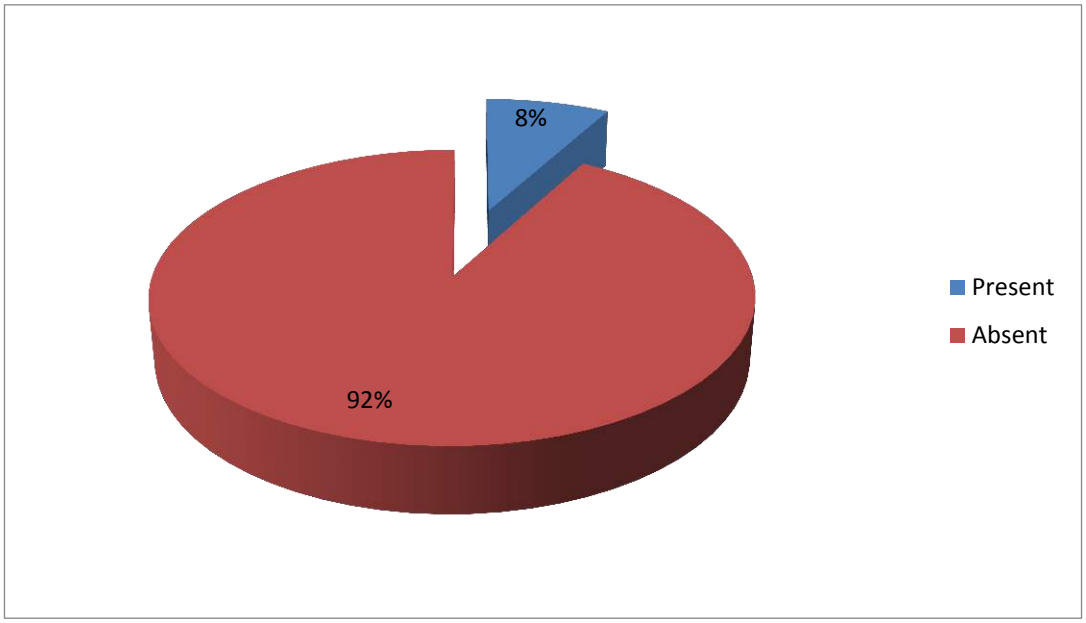
n= no. of patients

In this study majority 46(92%) of the perforations margins were free and granulations were seen only in 4(8%) of patients.

FIGURE 27

Granuloma on perforation margins of patients taken up for Tympanoplasty

(n=50)



n= no. of patients

In this study majority 46(92%) of the perforations margins were free and granulations were seen only in 4(8%) of patients.

TABLE 18

Surgical intervention and nature of anaesthesia

(n=50)

Nature of anaesthesia	No. of patients	% of patients
GA (General anaesthesia)	50	100%
LA (Local anaesthesia)	0	0%
MAC (Minimum anaesthesia concenteration)	0	0%
Total	50	100%

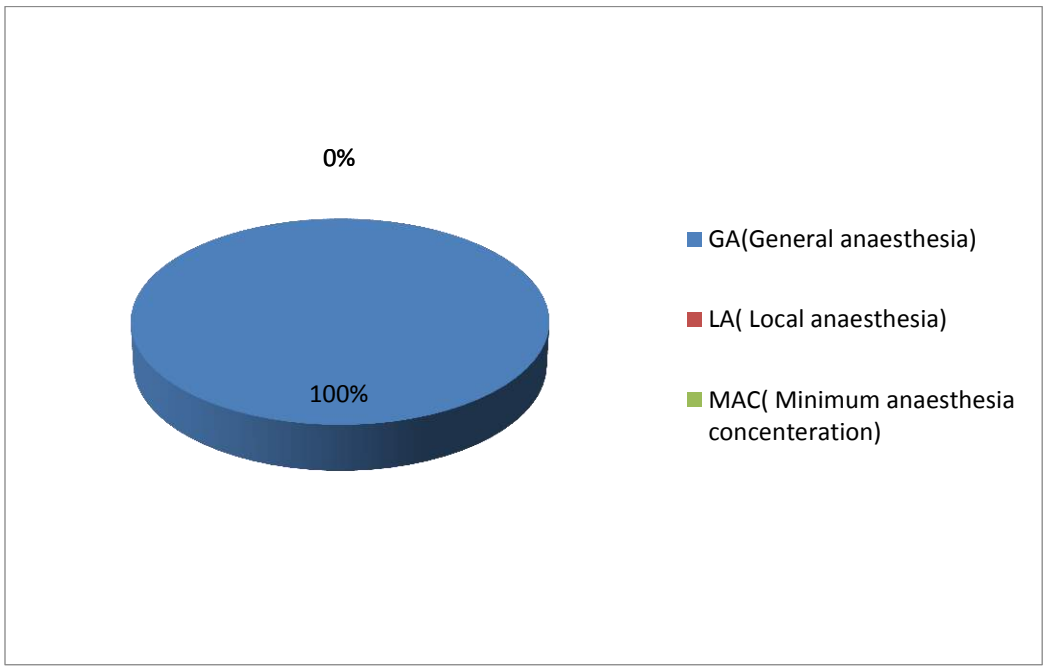
n= no. of patients

In this study group all 50 patients underwent surgery under general anaesthesia.

FIGURE 28

Surgical intervention and nature of anaesthesia

(n=50)



n= no. of patients

In this study group all 50 patients underwent surgery under general anaesthesia.

TABLE 19

Surgical approach undertaken in either group

(n=50)

Approach	No. of patients	% of patients
Post-aural	25	50%
Endaural	21	42%
Transcanal/ permeatal	4	8%
Total	50	100%

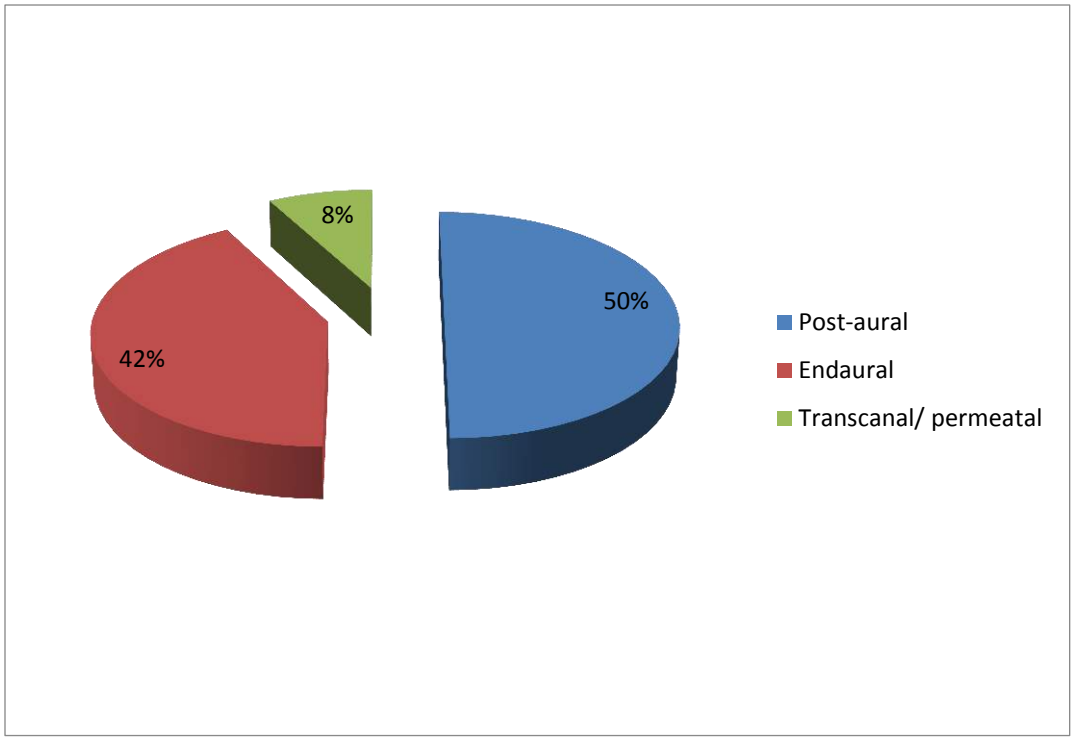
n= no. of patients

25 (50%) patients were operated via postaural, 21 (42%) endaural and 4 (8%) via permeatal approach.

FIGURE 29

Surgical approach undertaken in either group

(n=50)



n= no. of patients

25 (50%) patients were operated via postaural , 21 (42%) endaural and 4 (8%) via permeatal approach.

TABLE 20

Canaloplasty

(n=50)

Canaloplasty	No. of patients	% of patients
Undertaken	5	10%
Note undertaken	45	90%
Total	50	100%

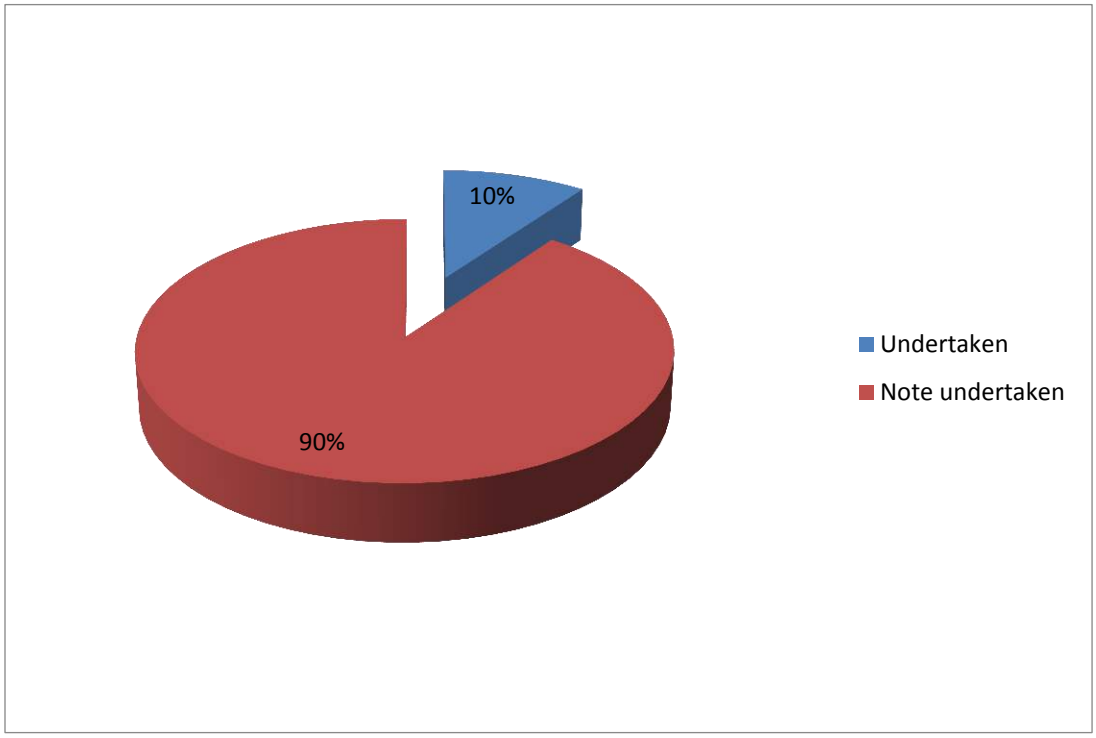
n= no. of patients

In this study to see the annulus circumferentially, canaloplasty was carried in 5 (10%) patients.

FIGURE 30

Canaloplasty

(n=50)



n= no. of patients

In this study to see the annulus circumferentially, canaloplasty was carried in 5 (10%) patients.

TABLE 21

Surgical technique undertaken

(n=50)

Technique	No. of patients	% of patients
Malleus medialisation	**25**	**50%**
Malleus lateralization	**25**	**50%**
Total	**50**	**100%**

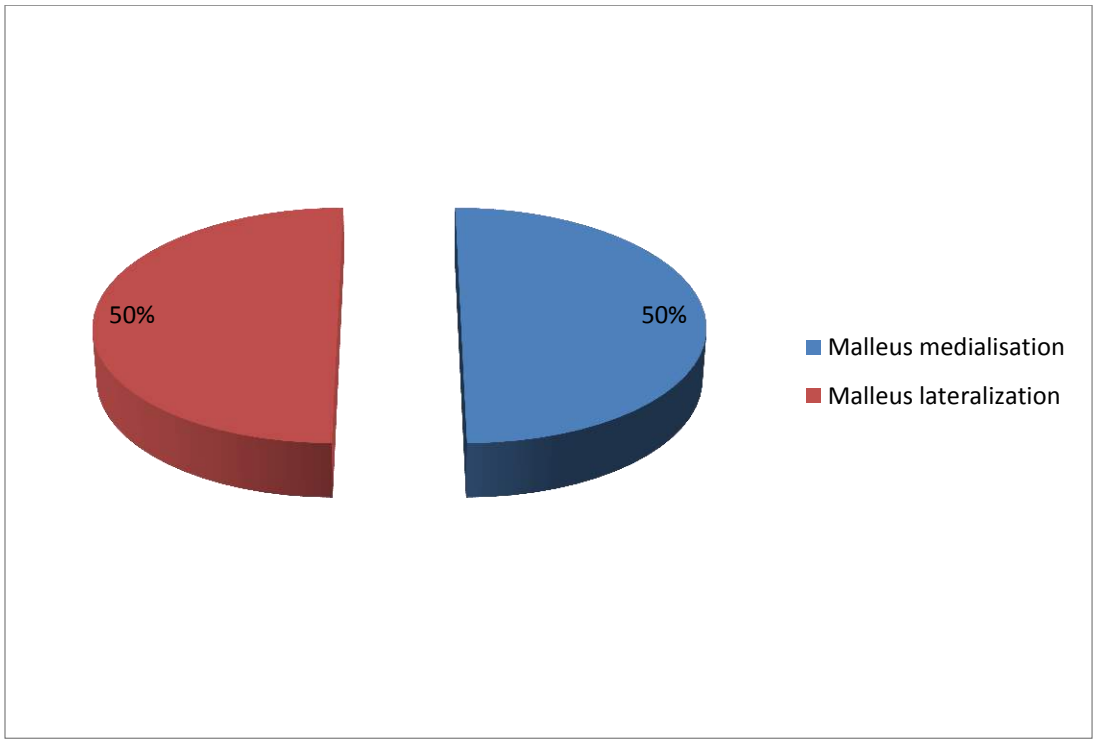
n= no. of patients

In this study group patients were randomly divided into two groups of 25 patients each.

FIGURE 31

Surgical technique undertaken

(n=50)



n= no. of patients

In this study group patients were randomly divided into two groups of 25 patients each.

C. POSTOPERATIVE OBSERVATIONS DURING THE 3 FOLLOW UP VISITS

TABLE 22

Overall post-operative graft uptake in either techniques

(n=50)

Successful graft uptake	No. of patients	% of patients
Yes	47	94%
No	3	6%
Total	50	100%

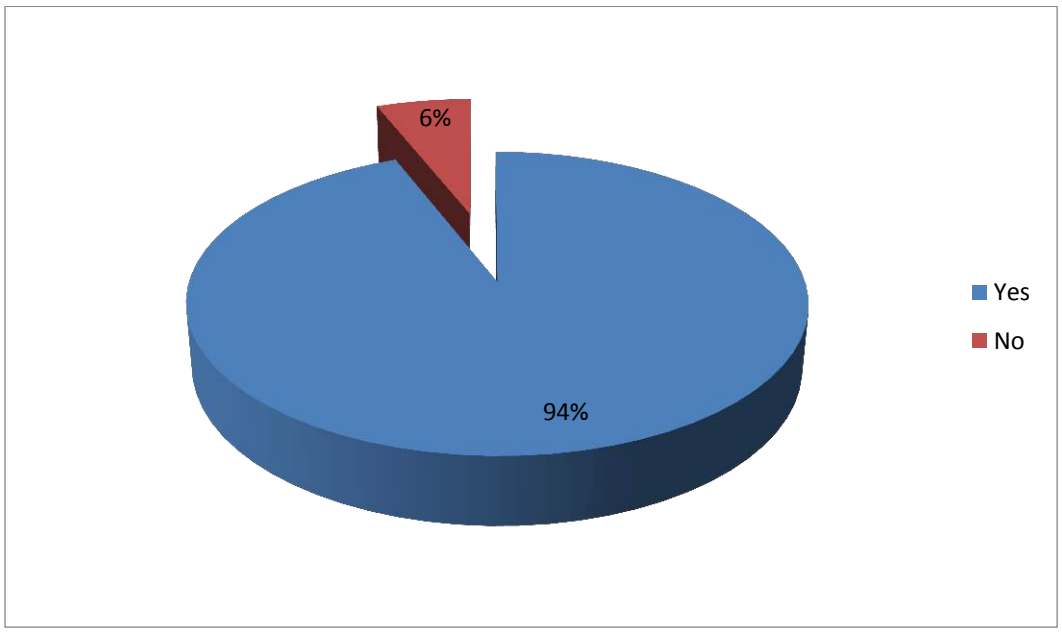
n= no. of patients

Overall success rate of graft uptake by either technique at the 24th week of follow up in our series of 50 patients was 94% i.e in 47 patients.

FIGURE 32

Overall post-operative graft uptake in either techniques

(n=50)



n= no. of patients

Overall success rate of graft uptake by either technique at the 24th week of follow up in our series of 50 patients was 94% i.e in 47 patients.

TABLE 23

Overall graft uptake in either technique at 6th, 12th and 24th week of follow up

(n=50)

Follow up week	Successful graft uptake	Graft uptake failure
6th	50	0
12th	49	1
24th	47	2
Total	47	3

n=no. of patients

Overall graft uptake success rate was 94%

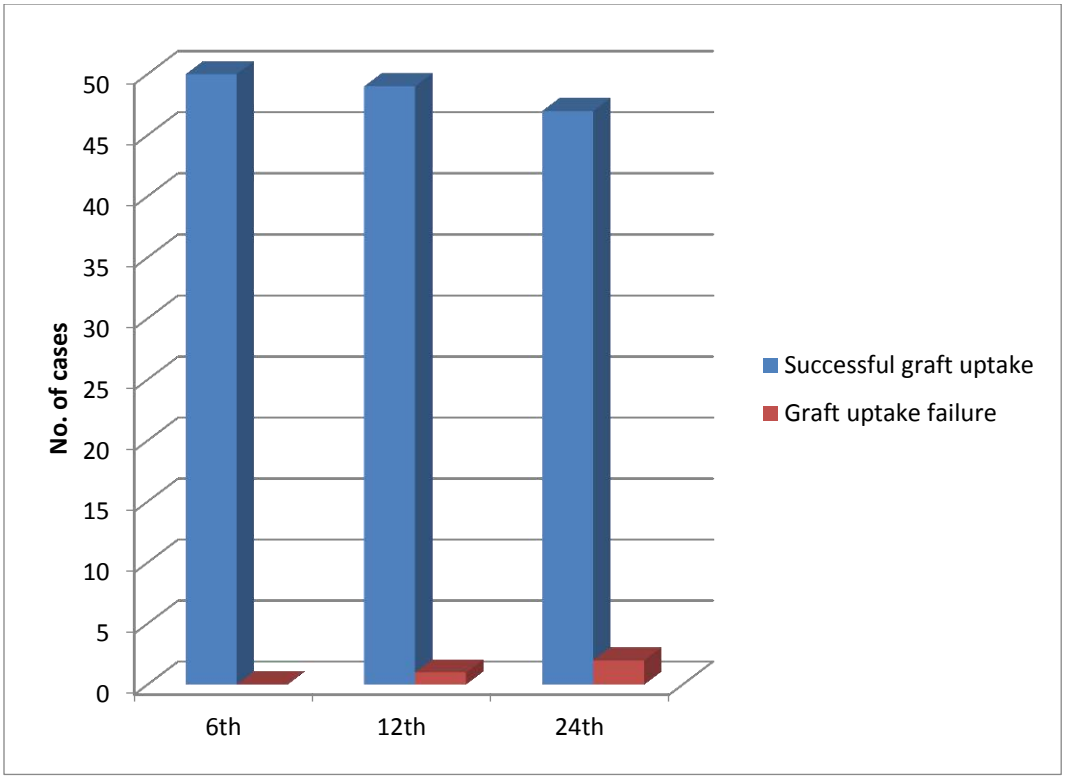
Overall failure rate of graft uptake was 6%

At 6th week of follow up all 50(100%) patients showed successfull uptake of graft. At 12th week there was 1 (2%) failure and at 24th week there were failure in 3(6%) failure in our series of 50 patients i.e overall success rate was in 47(94%). None of the patient was taken up revision surgery during the study period.

FIGURE 33

Overall graft uptake in either technique at 6th, 12th and 24th week of follow up

(n=50)



n=no. of patients

At 6th week of follow up all 50(100%) patients showed successfull uptake of graft. At 12th week there was 1 (2%) failure and at 24th week there were failure in 3(6%) failure in our series of 50 patients i.e overall success rate was in 47(94%). None of the patient was taken up revision surgery during the study period.

TABLE 24

Overall hearing gain in either technique

(n=50)

Follow up week	Hearing gain achieved	Hearing gain not achieved
6th	35	15
12th	40	10
24th	40	10
Total no. of patients	40	10

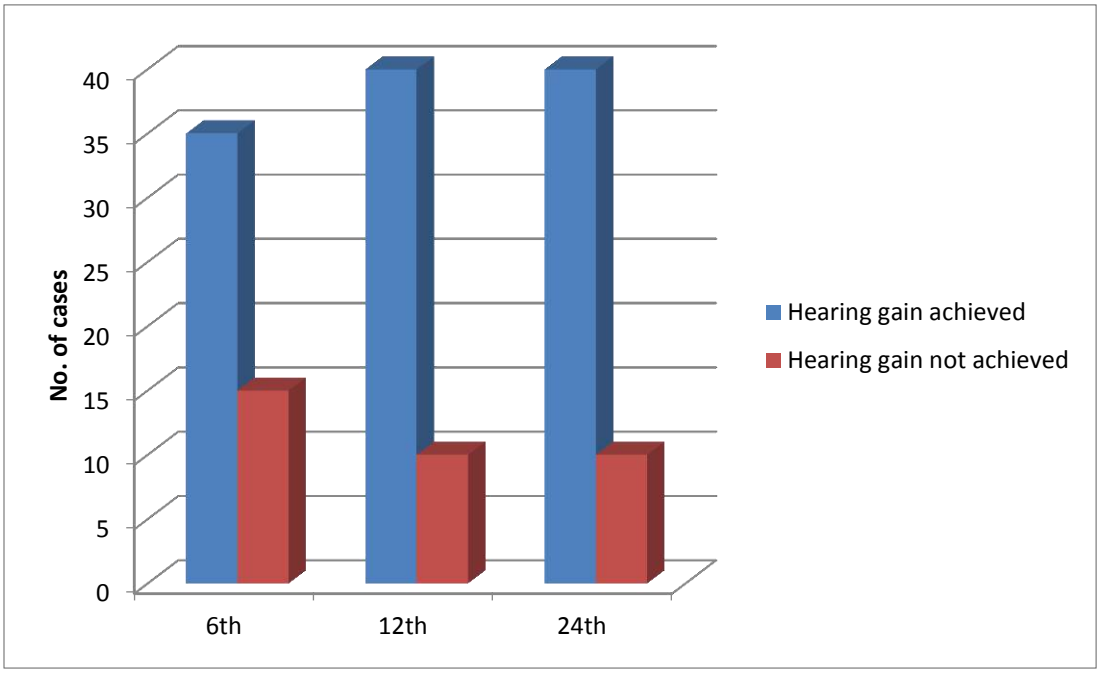
n= no. of patients

Overall success rate of hearing improvement by either technique at 6th week in 35(70%), at 12th week and at 24th week in 40(80%). There was no improvement in 15(30%) patients at 6th week but 5(10%) improved by the 24th week i.e overall hearing gain in 40(80%).

FIGURE 34

Overall hearing gain in either technique

(n=50)



n= no. of patients

Overall success rate of hearing improvement by either technique at 6th week in 35(70%), at 12th week and at 24th week in 40(80%). There was no improvement in 15(30%) patients at 6th week but 5(10%) improved by the 24th week i.e overall hearing gain in 40(80%).

TABLE 25

Overall AB gap improvement in both techniques

(n=50)

AB gap improvement	No. of patients	% of patients
Yes	37	74%
No	13	26%
Total no. of patients	50	100%

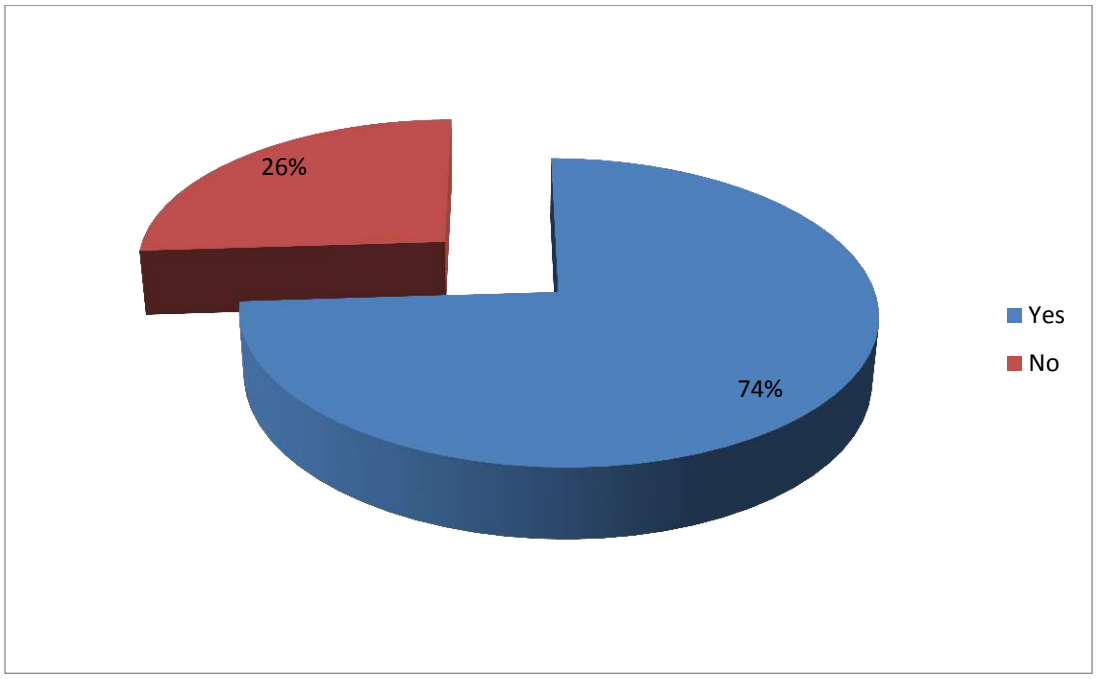
n= no. of patients

The AB gap reduced in 37(74%) of patients by the end of 24th week of follow up.

FIGURE 35

Overall AB gap improvement in both techniques

(n=50)



n= no. of patients

The AB gap reduced in 37 (74%) of patients by the end of 24th week of follow up.

TABLE 26

Overall graft uptake rate on 24th week of follow up in either technique of tympanoplasty

(n=50)

		Type				Total	Chi-squre value	p-value
		Medialisation		Lateralisation				
Graft uptake	failure on 24th week of follow up	1	4%	2	8%	3	0.355	0.552
	Yes	24	96%	23	92%	47		
Total		25	100%	25	100%	50		

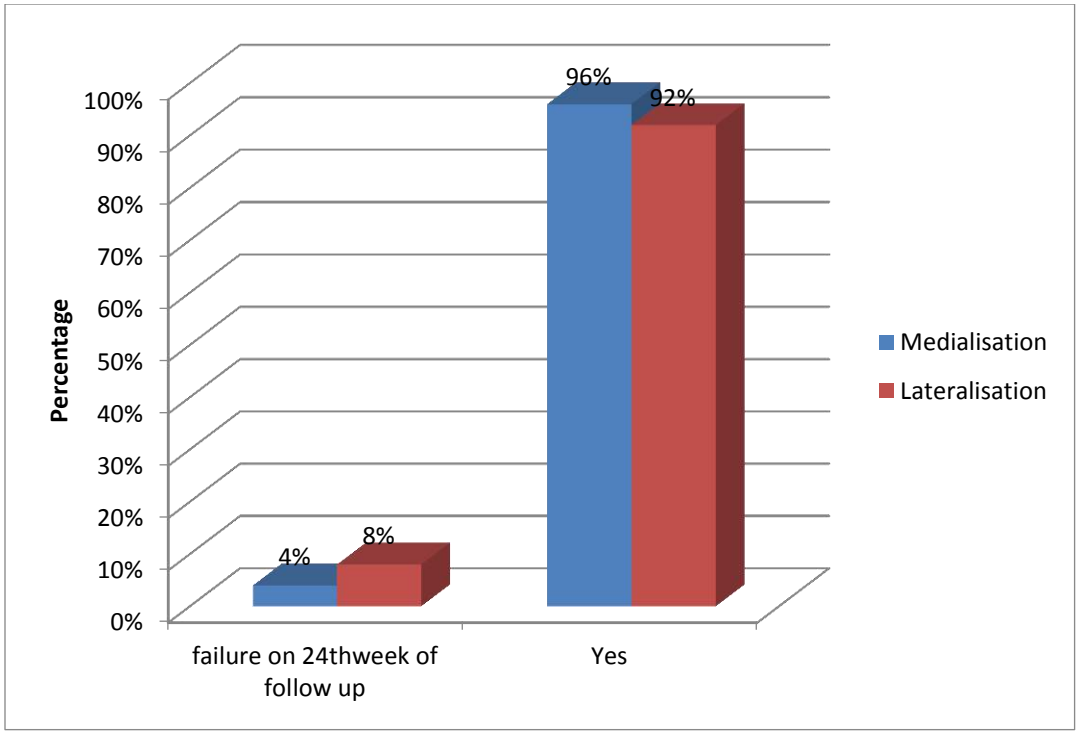
n= no. of patients

On 24th week of follow up graft uptake was in 24(96%) patients of medialisation and 23(92%) of lateralization tympanoplasty. 1(4%) failure of graft uptake in medialisation and 2(8%) in lateralization technique of tympanoplasty has noted. p-value=0.552.

FIGURE 36

Overall graft uptake rate on 24th week of follow up in either technique of tympanoplasty

(n=50)



n= no. of patients

On 24th week of follow up graft uptake was in 24(96%) patients of medialisation and 23(92%) of lateralization tympanoplasty. 1(4%) failure of graft uptake in medialisation and 2(8%) in lateralization technique of tympanoplasty has noted. p-value=0.552.

TABLE 27

Overall hearing gain on 24th week of follow up by either technique of tympanoplasty

(n=50)

		TYPE				Total	Chi-squre value	p-value
		Medialisation		Lateralisation				
Hearing gain	Improved	20	80%	20	80%	40	0.000	1.000
	Not improved	5	20%	5	20%	10		
Total		25	100%	25	100%	50		

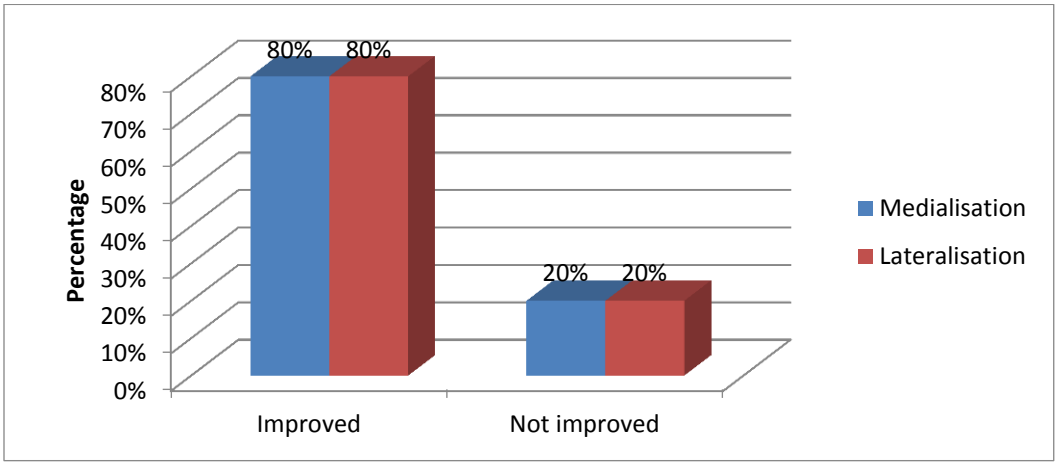
n= no. of patients

Overall hearing gain was noted in 80% of patients by either technique. Hearing gain was equal in both groups i.e 80%. P-value=1.000

FIGURE 37

Overall hearing gain on 24th week of follow up by either technique of tympanoplasty

(n=50)



n= no. of patients

Overall hearing gain was noted in 80% of patients by either technique. Hearing gain was equal in both groups i.e 80%. P-value=1.000

TABLE 28

Overall AB gap improvement on 24th week of follow up by either technique of tympanoplasty

(n=50)

		TYPE				Total	Chi-squre value	p-value
		Medialisation		Lateralisation				
AB Gap	Improved	18	72%	21	84%	19	4.160	0.041
	Same	7	28%	4	16%	31		
Total		25	100%	25	100%	50		

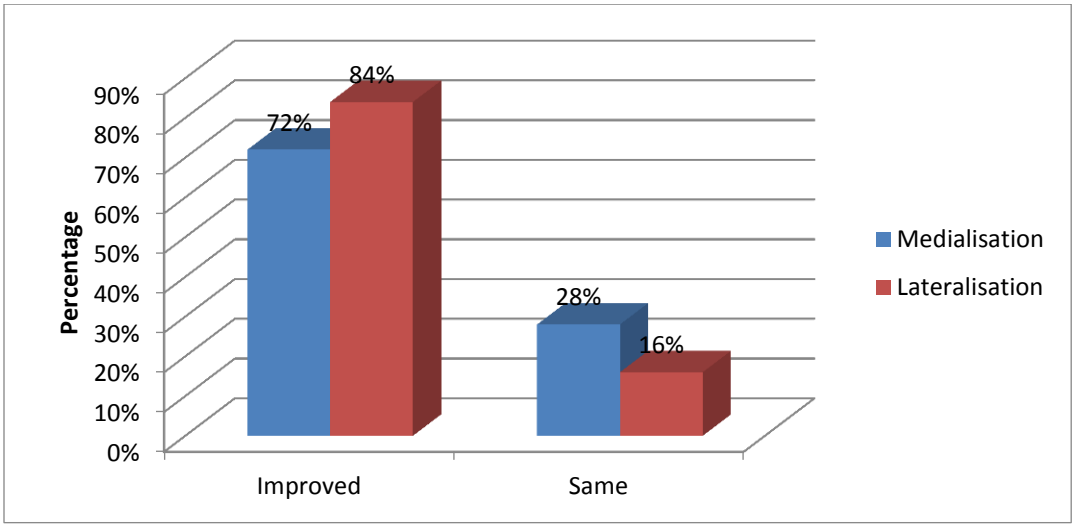
n=no. of patients

AB gap shift was 18(72%) with medialisation and 21(82%) with lateralization tympanoplasty. p-value=0.041.

FIGURE 38

Overall AB gap improvement on 24th week of follow up by either technique of tympanoplasty

(n=50)



n=no. of patients

AB gap shift was 18(72%) with medialisation and 21(82%) with lateralization tympanoplasty. p-value=0.041.

TABLE 29

AB gap shift by either technique on 24th week of follow up

(n=50)

AB gap shift in	Medialisation tympanoplasty	Lateralization tympanoplasty
0-10db	1	6
11-20db	11	14
21-30db	4	1
Total	16	21

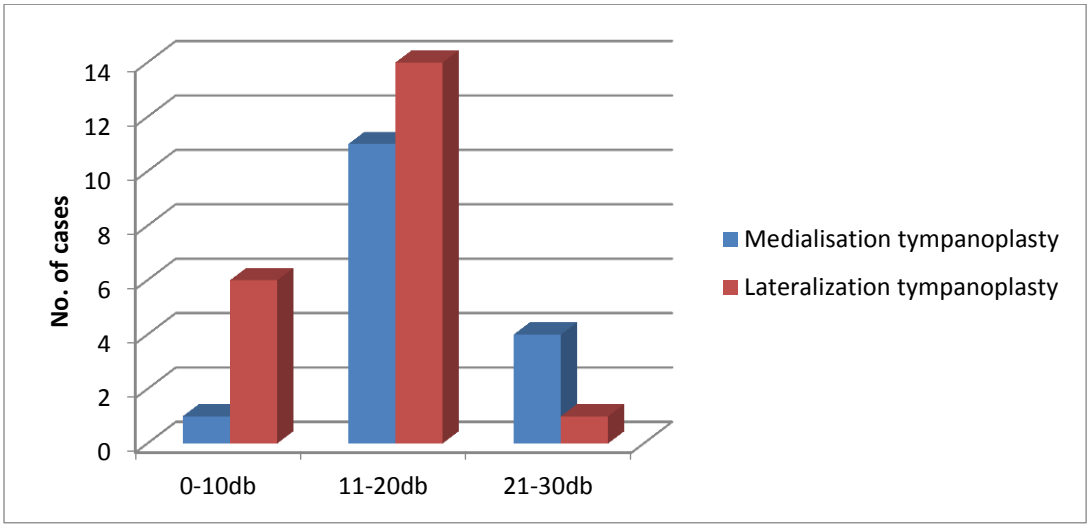
n= no. of patients

0-10db of AB gap shift was noted in 1 medialisation and 6 subjects of lateralisation tympanoplasty. 11-20 db shift was noted in 11 medialisation and 14 lateralisation patients, 21-30 db of shift noted in 4 medialisation and 1 lateralisation tympanoplasty.

FIGURE 39

AB gap shift by either technique on 24th week of follow up

(n=50)



n= no. of patients

0-10db of AB gap shift was noted in 1 medialisation and 6 subjects of lateralisation tympanoplasty. 11-20 db shift was noted in 11 medialisation and 14 lateralisation patients, 21-30 db of shift noted in 4 medialisation and 1 lateralisation tympanoplasty.

TABLE 30

Correlation of graft uptake with gender after 24th week of follow up in either technique

(n=50)

Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 24th week of follow up		Uptake				
Medial to handle of malleus	Gender	Female	1	6%	16	94%	17	0.490	0.484
		Male	0	0%	8	100%	8		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	Gender	Female	2	13 %	14	88%	16	1.223	0.269
		Male	0	0%	9	100%	9		
	Total		2	8%	23	92%	25		

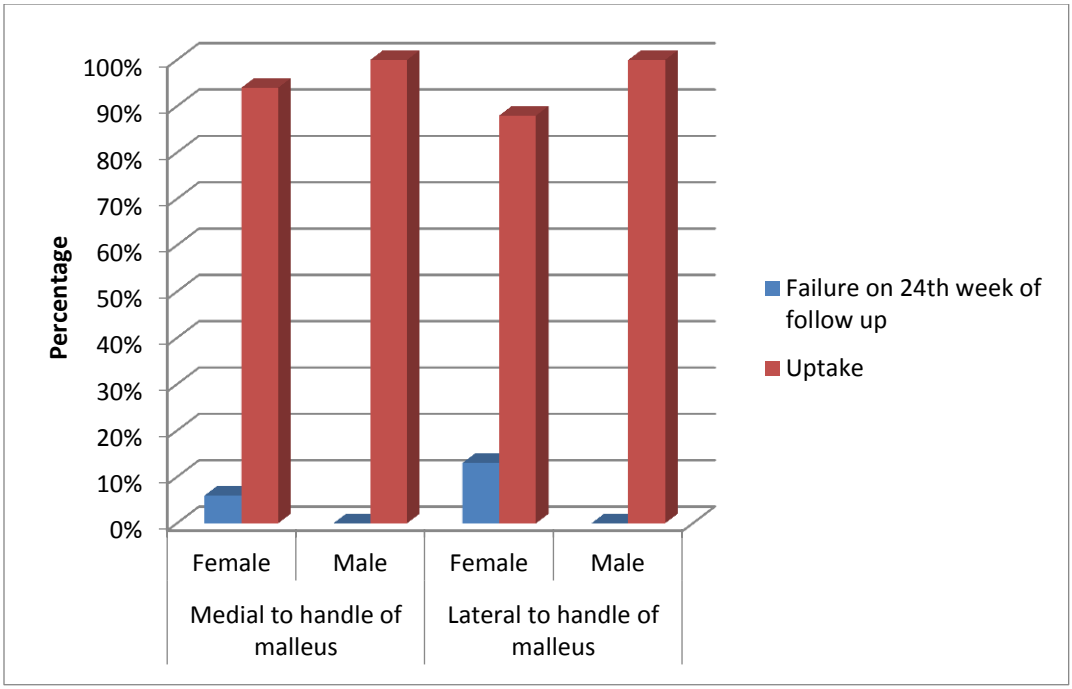
n=no. of patients

In the graft placement medial to handle of malleus, females showed 94% graft uptake i.e 16 out of 17and males showed 100% uptake i.e 8 out of 8. p value=0.484. In graft placement lateral to handle of malleus, females showed 88% graft uptake i.e 14 out of 16 and males showed 100% i.e 9 out of 9. P value=0.269.

FIGURE 40

Correlation of graft uptake with gender after 24th week of follow up in either technique

(n=50)



n=no. of patients

In the graft placement medial to handle of malleus, females showed 94% graft uptake i.e 16 out of 17and males showed 100% uptake i.e 8 out of 8. p value=0.484. In graft placement lateral to handle of malleus, females showed 88% graft uptake i.e 14 out of 16 and males showed 100% i.e 9 out of 9. P value=0.269.

TABLE 31

Correlation of hearing gain with gender after 24th week of follow up in either technique

(n=50)

Group		HEARING GAIN					Total	Chi-squre value	p-value
		Achieved			Not achieved				
Medial to handle of malleus	Gender	Female	14	82%	3	18%	17	0.184	0.668
		Male	6	75%	2	25%	8		
	Total		20	80%	5	20%	25		
Lateral to handle of malleus	Gender	Female	12	75%	4	25%	16	0.694	0.405
		Male	8	89%	1	11%	9		
	Total		20	80%	5	20%	25		

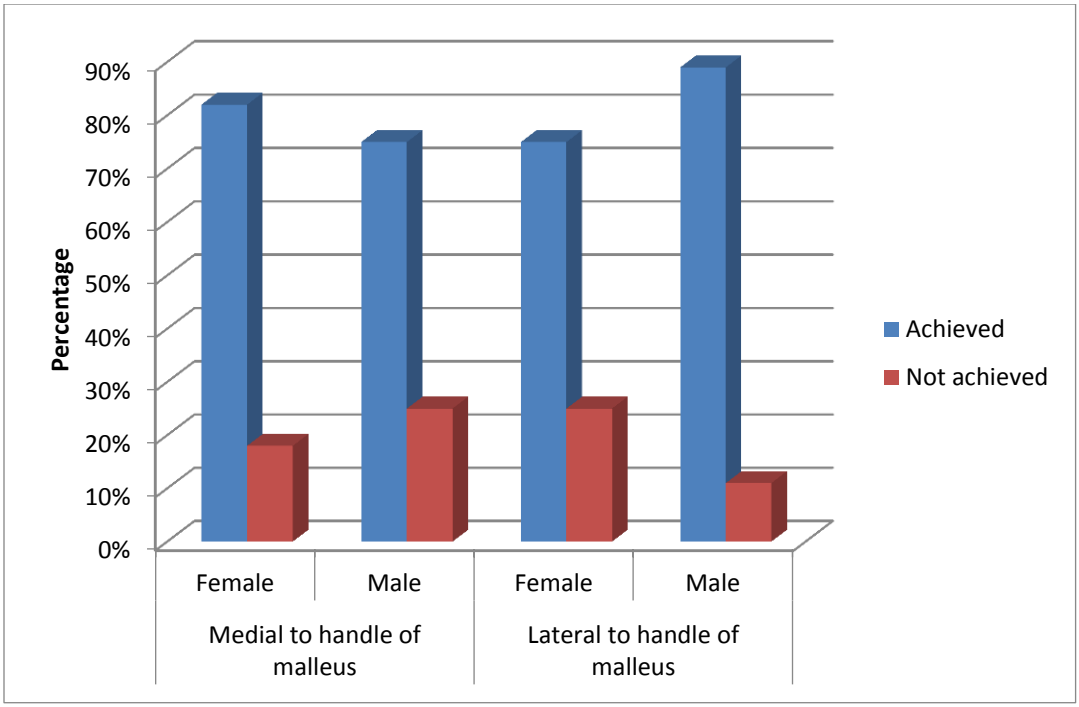
n=no. of patients

Hearing gain in 14 (82%) females and in 6 (75%) males with medialisation tympanoplasty. p value=0.668. Hearing gain was noted in 12(75%) females and 4(25%) males with lateralization tympanoplasty. p value=0.405.

FIGURE 41

Correlation of hearing gain with gender after 24th week of follow up in either technique

(n=50)



n=no. of patients

Hearing gain in 14 (82%) females and in 6(75%) males with medialisation tympanoplasty. p value=0.668. Hearing gain was noted in 12(75%) females and 4(25%) males with lateralization tympanoplasty. p value=0.405.

TABLE 32

Correlation of AB gap improvement on 24th week of follow up in either technique with gender

(n=50)

Group		AB GAP				Total	Chi-squre value	p-value
		IMPROVED		SAME				
Medial to handle of malleus	Female	14	82%	3	18%	17	2.989	0.224
	Male	4	50%	4	50%	8		
	Total	18	72%	7	28%	25		
Lateral to handle of malleus	Female	12	75%	4	25%	16	0.694	0.405
	Male	8	89%	1	11%	9		
	Total	20	80%	5	20%	25		

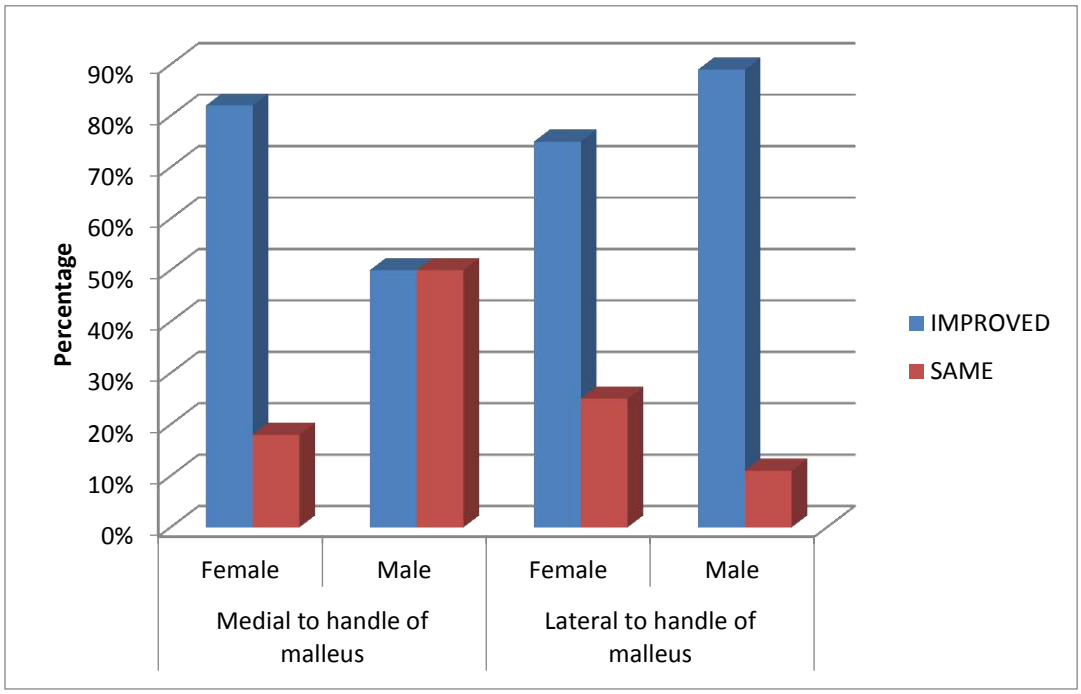
n=no. of patients

In 14(82%) females and 4(50%) males AB gap shift was noted in patients with graft placed medial to handle of malleus. P value=0.224. 12(75%) females and 8(89%) males AB gap shift was noted in patients with graft placed lateral to handle of malleus. P value=0.405.

FIGURE 42

Correlation of AB gap improvement on 24th week of follow up in either technique with gender

(n=50)



n=no. of patients

In 14(82%) females and 4(50%) males AB gap shift was noted in patients with graft placed medial to handle of malleus. P value=0.224. 12(75%) females and 8(89%) males AB gap shift was noted in patients with graft placed lateral to handle of malleus. P value=0.405.

TABLE 33

Correlation of graft uptake with socio-economic status after 24th week of follow up in either technique

(n=50)

Group		GRAFT UPTAKE				Total	Chi-squre value	p-value
		Failure on 24th week follow up		Successful				
Medial to handle of malleus	Rural	0	0%	11	100%	11	0.818	0.366
	Urban	1	7%	13	93%	14		
	Total	1	4%	24	96%	25		
Lateral to handle of malleus	Rural	1	6%	16	94%	17	0.324	0.569
	Urban	1	13%	7	88%	8		
	Total	2	8%	23	92%	25		

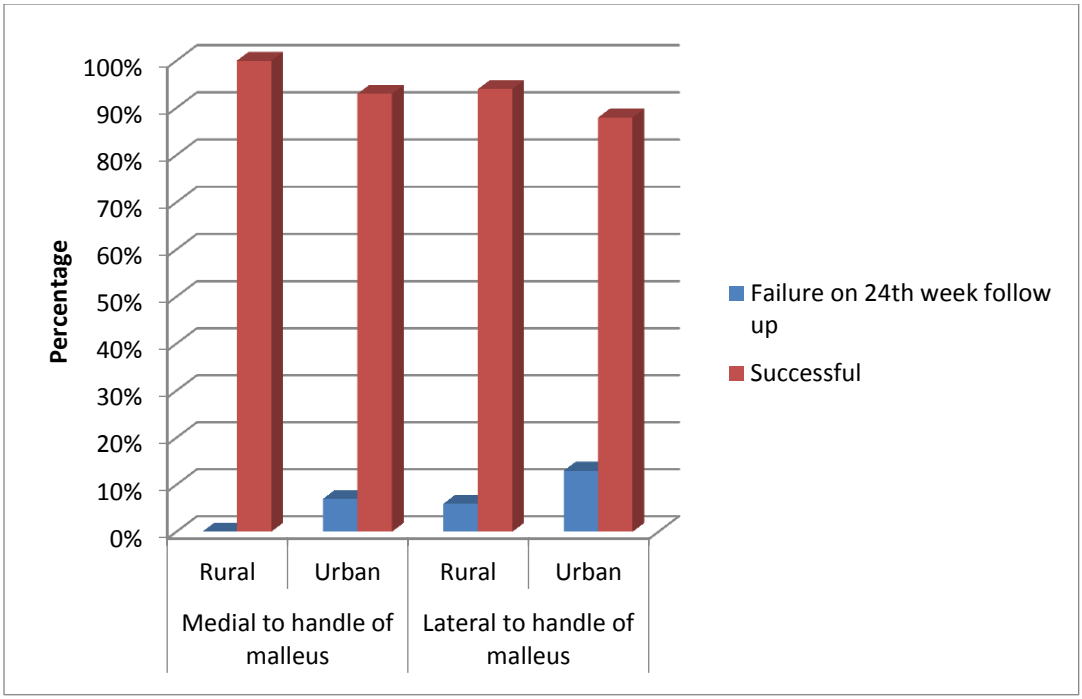
n= no. of patients

There was 1(7%) failure of graft uptake on 24th week of follow up in patient resident of urban locality. p value=0.366. There was failure of graft uptake in 1(6%) rural and 1(13%) in urban locality patients. p value=0.569

FIGURE 43

Correlation of graft uptake with socio-economic status after 24th week of follow up in either technique

(n=50)



n= no. of patients

There was 1(7%) failure of graft uptake on 24th week of follow up in patient resident of urban locality. p value=0.366. There was failure of graft uptake in 1(6%) rural and 1(13%) in urban locality patients. p value=0.569

TABLE 34

Correlation of hearing gain with socio-economic status after 24th week of follow up in either technique

(n=50)

Group		HEARING GAIN				Total	Chi-squre value	p-value
		Achieved		Not achieved				
Medial to handle of malleus	Rural	8	73%	3	27%	11	0.649	0.42
	Urban	12	86%	2	14%	14		
	Total	20	80%	5	20%	25		
Lateral to handle of malleus	Rural	15	88%	2	12%	17	2.252	0.283
	Urban	5	63%	3	38%	8		
	Total	20	80%	5	20%	25		

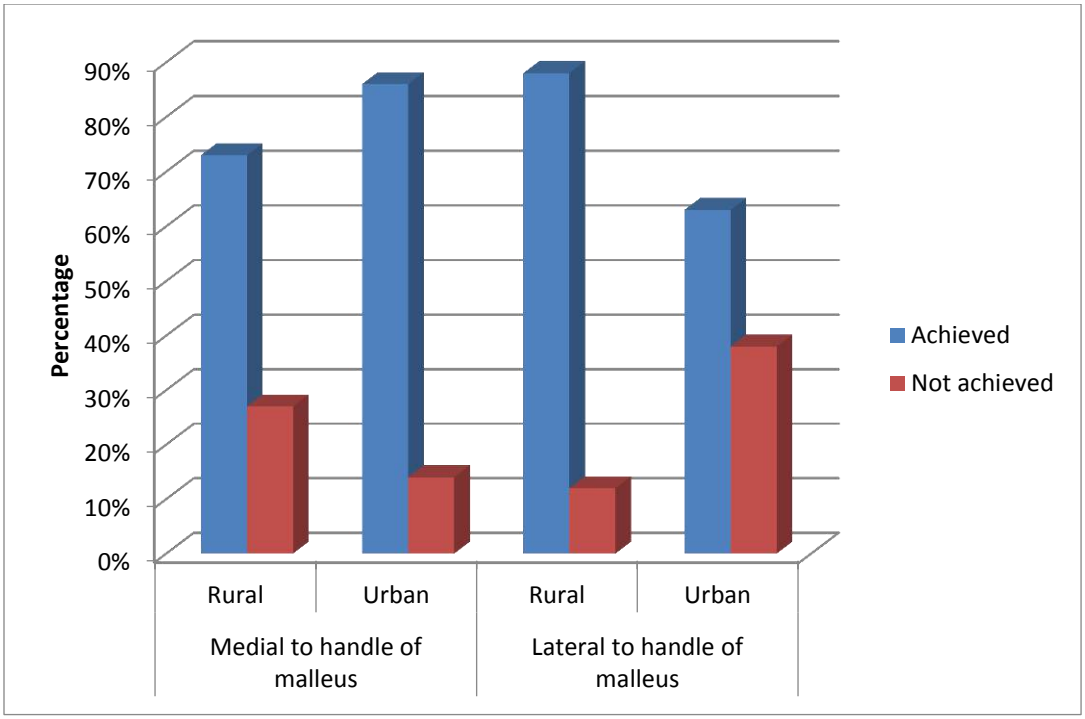
n=no. of patients

Hearing gain was noted in 8(73%) rural and 12(80%) urban locality patients with medialisation tympanoplasty. p value=0.42. Hearing gain was seen in 15(88%) rural and 5(63%) urban locality patients with lateralization tympanoplasty. p value=0.283

FIGURE 44

Correlation of hearing gain with socio-economic status after 24th week of follow up in either technique

(n=50)



n=no. of patients

Hearing gain was noted in 8(73%) rural and 12(80%) urban locality patients with medialisation tympanoplasty. p value=0.42. Hearing gain was seen in 15(88%) rural and 5(63%) urban locality patients with lateralization tympanoplasty. p value=0.283

TABLE 35

Correlation of AB gap shift with socio-economic status after 24th week of follow up in either technique

(n=50)

Group		AB GAP				Total	Chi-squre value	p-value
		IMPROVED		SAME				
Medial to handle of malleus	Rural	7	64%	4	36%	11	0.682	0.409
	Urban	11	79%	3	21%	14		
	Total	18	72%	7	28%	25		
Lateral to handle of malleus	Rural	14	82%	3	18%	17	0.184	0.668
	Urban	6	75%	2	25%	8		
	Total	20	80%	5	20%	25		

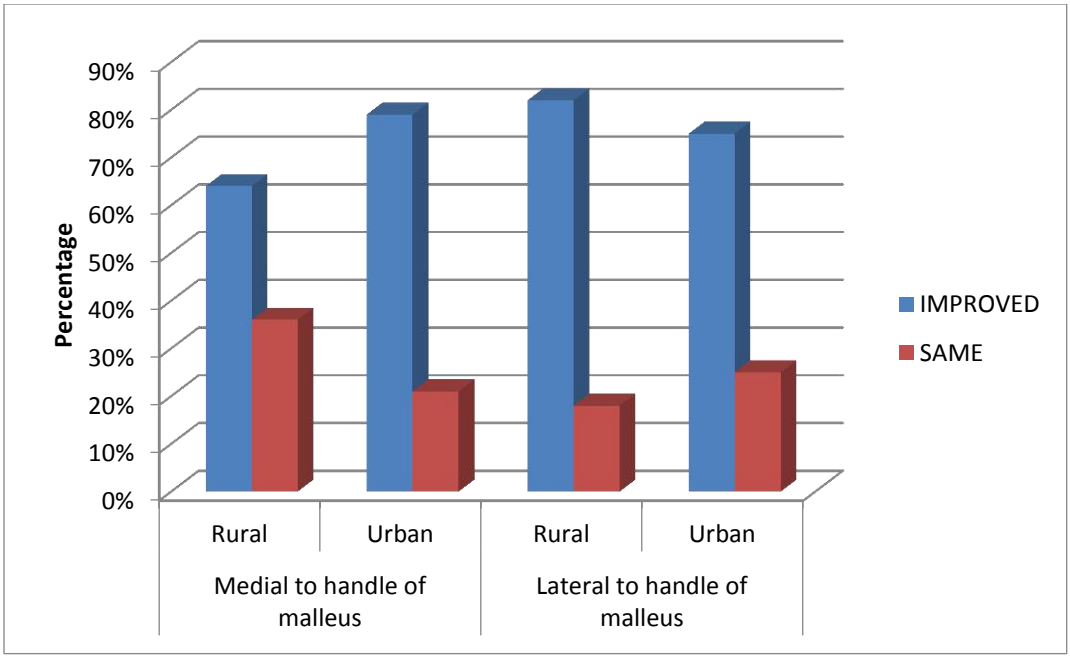
n=no. of patients

AB gap shift was observed in 11(79%) urban and 7(64%) rural patients with graft placed medial to handle of malleus. P value=0.409. 14(82%) rural and 6(75%) urban patients showed AB gap shift with graft placed lateral to handle of malleus. P value=0.668.

FIGURE 45

Correlation of AB gap shift with socio-economic status after 24th week of follow up in either technique

(n=50)



n=no. of patients

AB gap shift was observed in 11(79%) urban and 7(64%) rural patients with graft placed medial to handle of malleus. P value=0.409. 14(82%) rural and 6(75%) urban patients showed AB gap shift with graft placed lateral to handle of malleus. P value=0.668.

TABLE 36

Correlation of graft uptake with etiology of disease after 24th week of follow up in either technique

(n=50)

Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 24th week follow up		Successful				
Medial to handle of malleus	Etiology	ASOM	1	4%	24	96%	25		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	Etiology	ASOM	2	9%	20	91%	22	0.296	0.862
		NOT KNOWN	0	0%	2	100%	2		
		TRAUMA	0	0%	1	100%	1		
	Total		2	8%	23	92%	25		

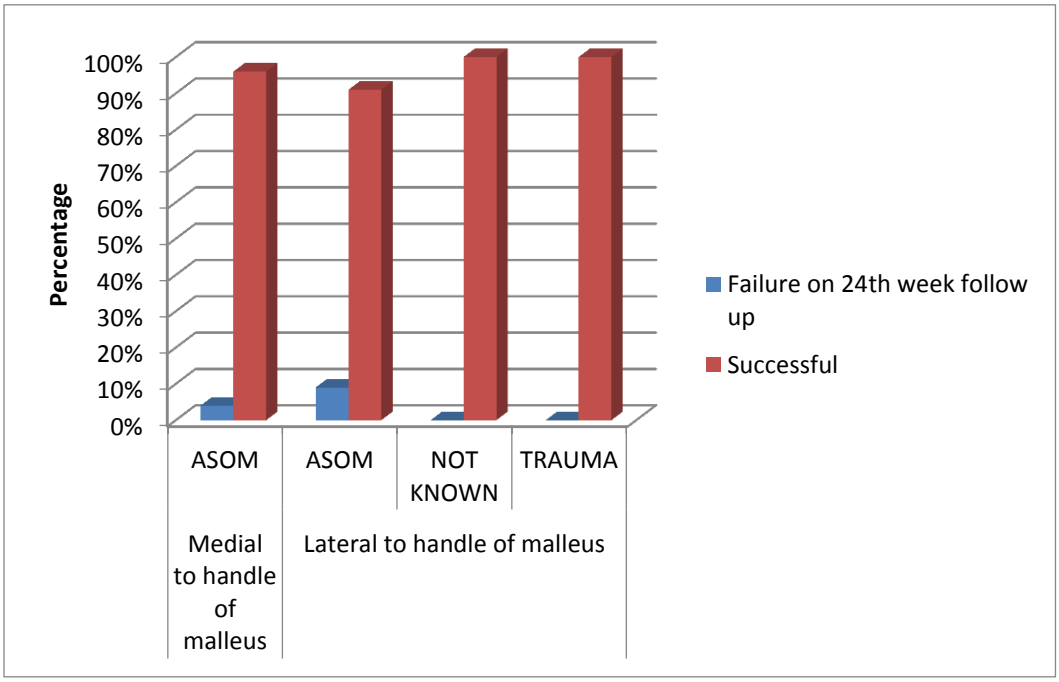
n= no. of patients

1(4%) failure of graft uptake at 24th week follow up in patients with etiology of acute suppurative otitis media. 2(9%) failure of graft uptake at 24th week follow up in patients with etiology of acute suppurative otitis media. p value=0.862

FIGURE 46

Correlation of graft uptake with etiology of disease after 24th week of follow up in either technique

(n=50)



n= no. of patients

1(4%) failure of graft uptake at 24th week follow up in patients with etiology of acute suppurative otitis media. 2(9%) failure of graft uptake at 24th week follow up in patients with etiology of acute suppurative otitis media. p value=0.862

TABLE 37

Correlation of hearing gain with etiology of disease after 24th week of follow up in either technique

(n=50)

Group			HEARING GAIN				Total	Chi-squre value	p-value
			Achieved		Not achieved				
Medial to handle of malleus	Etiology	ASOM	20	80%	5	20%	25		
	Total		20	80%	5	20%	25		
Lateral to handle of malleus	Etiology	ASOM	18	82%	4	18%	22	1.420	0.492
		NOT KNOWN	1	50%	1	50%	2		
		TRAUMA	1	100%	0	0%	1		
	Total		20	80%	5	20%	25		

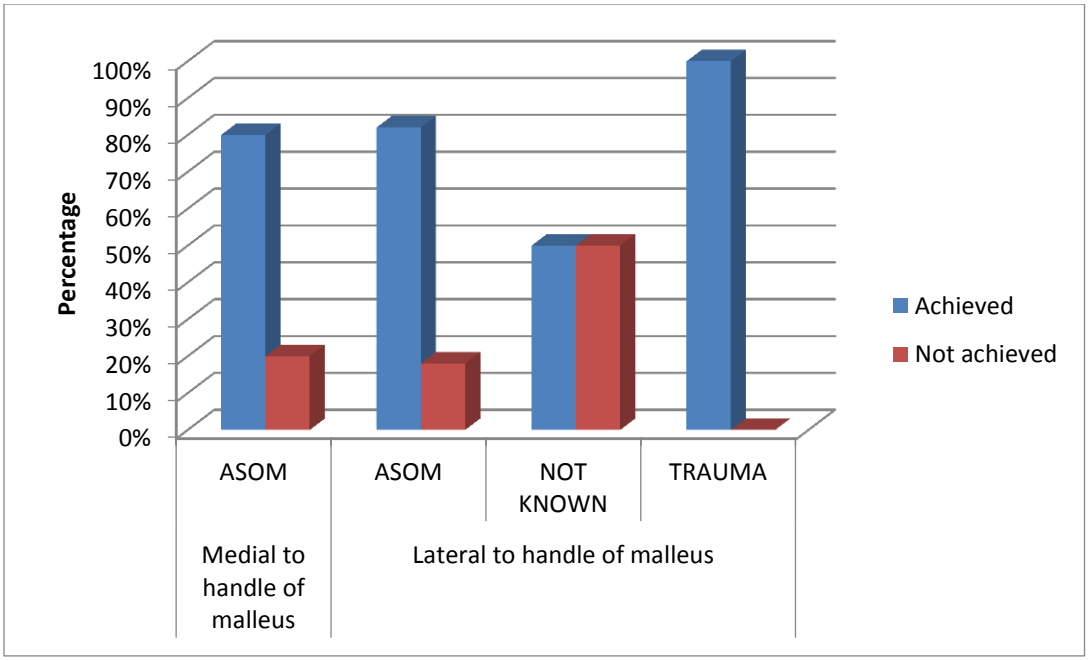
n= no. of patients

Hearing gain was noted in 20(80%) patients with medialisation tympanoplasty with etiology of acute suppurative otitis media. Hearing gain was noted in 18 (82%) of acute suppurative otitis media 1(50%) unknown and 1(100%) traumatic etiology with lateralisation tympanoplasty. P value=0.492

FIGURE 47

Correlation of hearing gain with etiology of disease after 24th week of follow up in either technique

(n=50)



n= no. of patients

Hearing gain was noted in 20(80%) patients with medialisation tympanoplasty with etiology of acute suppurative otitis media. Hearing gain was noted in 18(82%) of acute suppurative otitis media 1(50%) unknown and 1(100%) traumatic etiology with lateralisation tympanoplasty . P value=0.492

TABLE 38

Correlation of AB gap shift with etiology of disease after 24th week of follow up in either technique

(n=50)

Group			AB GAP				Total	Chi-squre value	p-value
			IMPROVED		SAME				
Medial to handle of malleus	Etiology	ASOM	18	72%	7	28%	25		
	Total		18	72%	7	28%	25		
Lateral to handle of malleus	Etiology	ASOM	17	77%	5	23%	22	0.852	0.653
		NOT KNOWN	2	100%	0	0%	2		
		TRAUMA	1	100%	0	0%	1		
	Total		20	80%	5	20%	25		

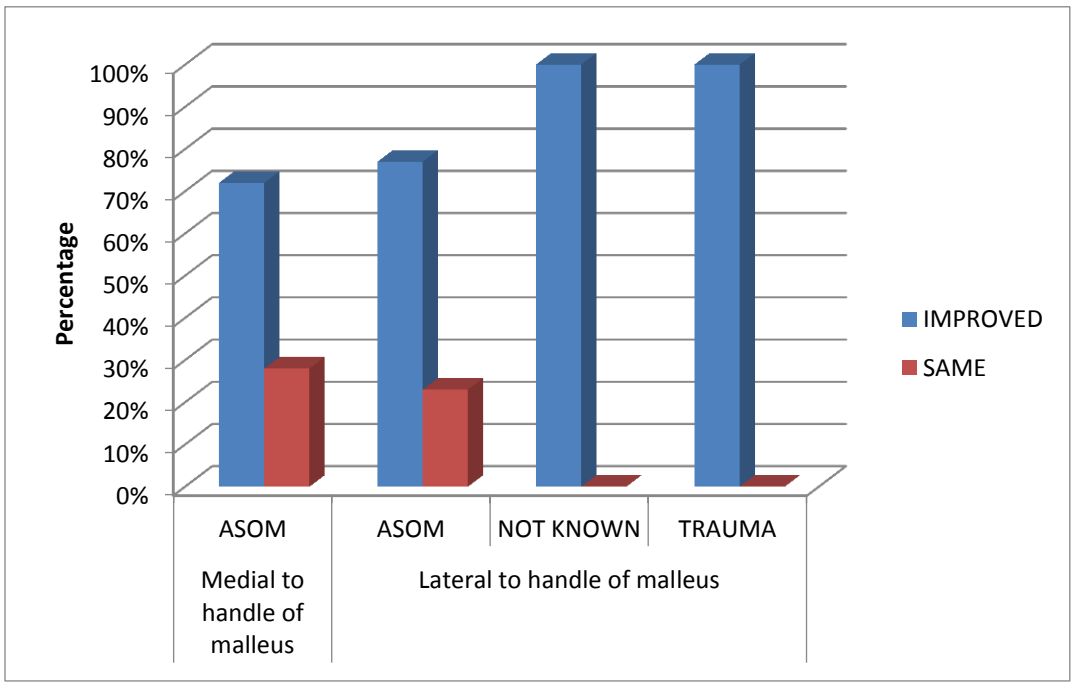
n=no. of patients

AB gap shift was noted in 18(72%) patients noted with etiology of acute suppurative otitis media with graft placed medial to handle of malleus. 17(77%) with acute suppurative otitis media 1(100%) trauma and 2(100%) with unknown etiology showed AB gap shift with graft placed lateral to handle of malleus. P value=0.653.

FIGURE 48

Correlation of AB gap shift with etiology of disease after 24th week of follow up in either technique

(n=50)



n=no. of patients

AB gap shift was noted in 18(72%) patients noted with etiology of acute suppurative otitis media with graft placed medial to handle of malleus. 17(77%) with acute suppurative otitis media 1(100%) trauma and 2(100%) with unknown etiology showed AB gap shift with graft placed lateral to handle of malleus. P value=0.653.

TABLE 39

Correlation of graft uptake with size of perforation after 24th week of follow up in either technique

(n=50)

Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 24th week follow up		Successful				
Medial to handle of malleus	SIZE	LARGE	1	9%	10	91%	11	1.326	0.723
		MEDIUM	0	0%	8	100%	8		
		S.TOTAL	0	0%	5	100%	5		
		SMALL	0	0%	1	100%	1		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	SIZE	LARGE	1	13%	7	88%	8	0.883	0.927
		MARGINAL	0	0%	1	100%	1		
		MEDIUM	1	10%	9	90%	10		
		S.TOTAL	0	0%	2	100%	2		
		SMALL	0	0%	4	100%	4		
	Total		2	8%	23	92%	25		

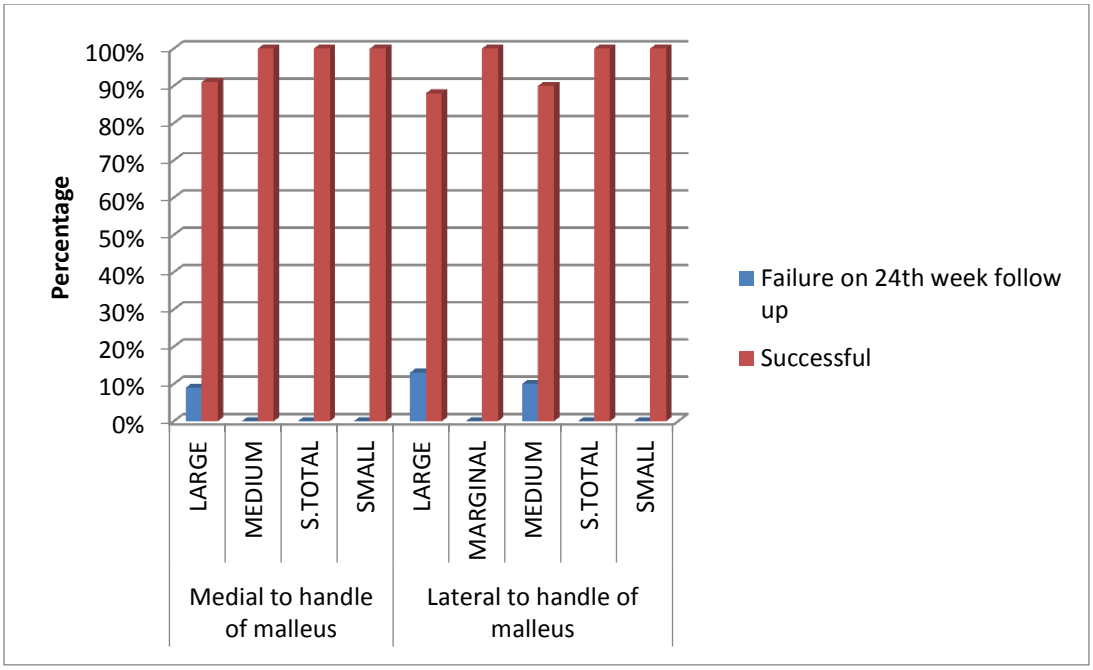
n=no. of patients

Graft uptake was in 10(91%)large followed by 8(100%)medium, 5(100%) sub-total and 1(100%) small size of perforations. P value=0.723. Graft uptake was in 9(90%) medium followed by 7(88%) large, 4(100%) small, 2(100%) sub-total and 1(100%) in marginal perforation. P value=0.927

FIGURE 49

Correlation of graft uptake with size of perforation after 24th week of follow up in either technique

(n=50)



n=no. of patients

Graft uptake was in 10(91%)large followed by 8(100%)medium, 5(100%) sub-total and 1(100%) small size of perforations. P value=0.723. Graft uptake was in 9(90%) medium followed by 7(88%) large, 4(100%) small, 2(100%) sub-total and 1(100%) in marginal perforation. P value=0.927

TABLE 40

Correlation of hearing gain with size of perforation after 24th week of follow up in either technique

(n=50)

Group			HEARING GAIN				Total	Chi-squre value	p-value
			Achieved		Not achieved				
Medial to handle of malleus	SIZE	LARGE	9	82%	2	18%	11	0.398	0.941
		MEDIUM	6	75%	2	25%	8		
		S.TOTAL	4	80%	1	20%	5		
		SMALL	1	100%	0	0%	1		
	Total		20	80%	5	20%	25		
Lateral to handle of malleus	SIZE	LARGE	5	63%	3	38%	8	3.281	0.512
		MARGINAL	1	100%	0	0%	1		
		MEDIUM	8	80%	2	20%	10		
		S.TOTAL	2	100%	0	0%	2		
		SMALL	4	100%	0	0%	4		
	Total		20	80%	5	20%	25		

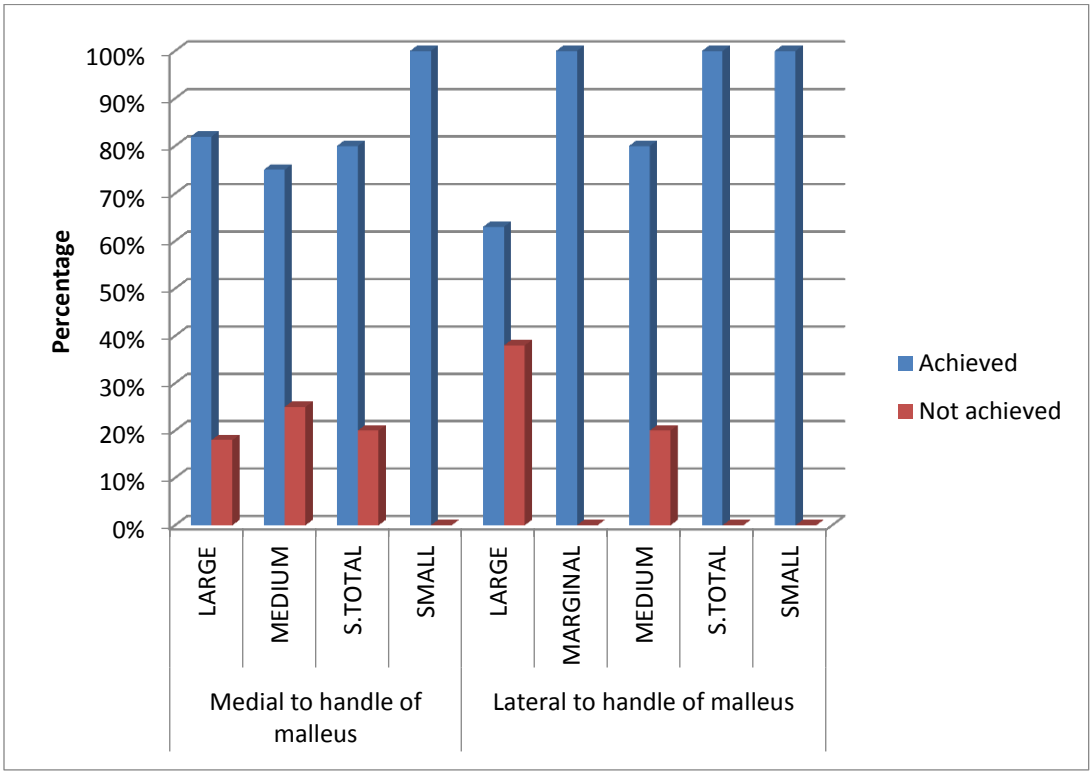
n= no. of patients

Hearing gain was noted in 9(82%) large perforation followed by 6(75%) medium, 4(80%) sub-total and 1(100%) small perforationin medialisation tympanoplasty. P value=0.941. Hearing gain in 8(80%) medium perforation followed by 5(63%) large, 4(100%) small, 2(100%) sub total and 1(100%) marginal. P value=0.512

FIGURE 50

Correlation of hearing gain with size of perforation after 24th week of follow up in either technique

(n=50)



n= no. of patients

Hearing gain was noted in 9(82%) large perforation followed by 6(75%) medium, 4(80%) sub-total and 1(100%) small perforationin medialisation tympanoplasty. P value=0.941. Hearing gain in 8(80%) medium perforation followed by 5(63%) large, 4(100%) small, 2(100%) sub total and 1(100%) marginal. P value=0.512

TABLE 41

Correlation of AB gap shift with size of perforation after 24th week of follow up in either technique

(n=50)

Group			AB GAP				Total	Chi-squre value	p-value
			IMPROVED		SAME				
Medial to handle of malleus	SIZE	LARGE	8	73%	3	27%	11	2.769	0.429
		MEDIUM	6	75%	2	25%	8		
		S.TOTAL	4	80%	1	20%	5		
		SMALL	0	0%	1	100 %	1		
	Total		18	72%	7	28%	25		
Lateral to handle of malleus	SIZE	LARGE	6	75%	2	25%	8	2.500	0.645
		MARGINAL	1	100%	0	0%	1		
		MEDIUM	7	70%	3	30%	10		
		S.TOTAL	2	100%	0	0%	2		
		SMALL	4	100%	0	0%	4		
	Total		20	80%	5	20%	25		

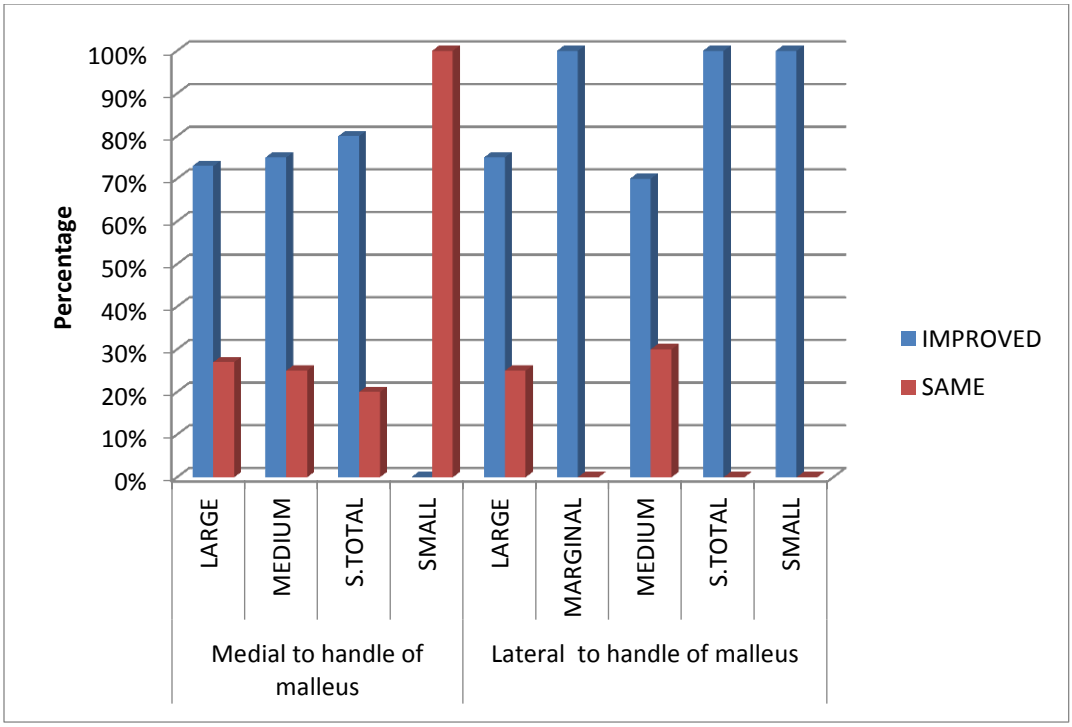
n=no. of patients

AB gap shift was noted in 8(73%) large, 6(75%) medium, 4(80%) sub total perforation with graft placed medial to handle of malleus. P value=0.429. 7(70%) medium, 6(75%) large, 4(100%) small and 2(100%) sub total perforation patients showed shift in AB gap shift with graft placed lateral to handle of malleus. P value=0.645.

FIGURE 51

Correlation of AB gap shift with size of perforation after 24th week of follow up in either technique

(n=50)



n=no. of patients

AB gap shift was noted in 8(73%) large, 6(75%) medium, 4(80%) sub total perforation with graft placed medial to handle of malleus. P value=0.429. 7(70%) medium, 6(75%) large, 4(100%) small and 2(100%) sub total perforation patients showed shift in AB gap shift with graft placed lateral to handle of malleus. P value=0.645.

TABLE 42

Correlation of graft uptake with location of perforation after 24th week of follow up in either technique

(n=50)

Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 3rd follow up		YES				
Medial to handle of malleus	LOCATION		0	0%	5	100%	5	1.326	0.857
		ANTERO SUPERIOR	0	0%	1	100%	1		
		POSTERO	0	0%	1	100%	1		
		POSTERO INFERIOR	1	9%	10	91%	11		
		POSTERO SUPERIOR	0	0%	7	100%	7		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	LOCATION		0	0%	2	100%	2	1.676	0.795
		ANTERO INFERIOR	1	20%	4	80%	5		
		ANTERO SUPERIOR	0	0%	2	100%	2		
		POSTERO INFERIOR	1	8%	11	92%	12		
		POSTERO SUPERIOR	0	0%	4	100%	4		
	Total		2	8%	23	92%	25		

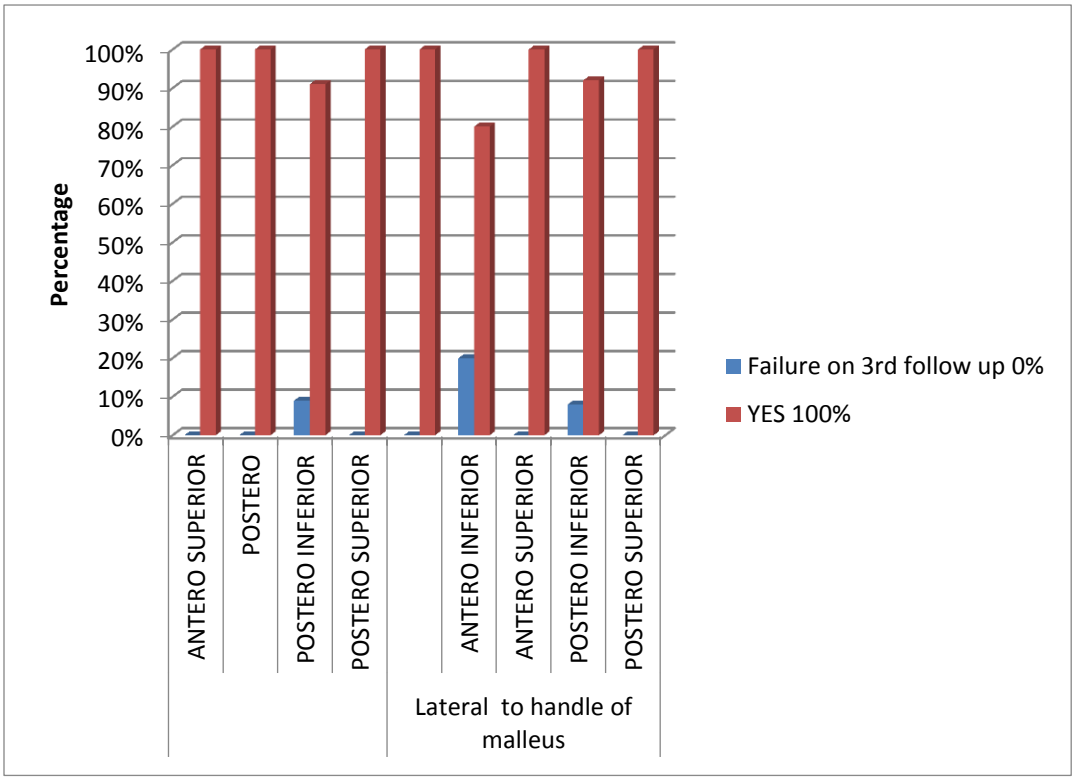
n=no. of patients

Graft uptake was noted in 10(91%) postero-inferior quadrent perforation and 100% in all other locaton perforations. P value=0.857. Graft uptake in 4(100%) antero-inferior, 2(100%) antero superior, 11(92%) postero superior and 4(80%) antero inferior perforation. P value=0.795

FIGURE 52

Correlation of graft uptake with location of perforation after 24th week of follow up in either technique

(n=50)



n=no. of patients

Graft uptake was noted in 10(91%) postero-inferior quadrent perforation and 100% in all other locaton perforations. P value=0.857. Graft uptake in 4(100%) antero-inferior, 2(100%) antero superior, 11(92%) postero superior and 4(80%) antero inferior perforation. P value=0.795

TABLE 43

Correlation of hearing gain with location of perforation after 24th week of follow up in either technique

(n=50)

Group			HEARING GAIN				Total	Chi-squre value	p-value
			Achieved		Not achieved				
Medial to handle of malleus	LOCATION		4	80%	1	20%	5	1.006	0.909
		ANTERO SUPERIOR	1	100%	0	0%	1		
		POSTERO	1	100%	0	0%	1		
		POSTERO INFERIOR	8	73%	3	27%	11		
		POSTERO SUPERIOR	6	86%	1	14%	7		
	Total		20	80%	5	20%	25		
Lateral to handle of malleus	LOCATION		2	100%	0	0%	2	3.333	0.504
		ANTERO INFERIOR	4	80%	1	20%	5		
		ANTERO SUPERIOR	2	100%	0	0%	2		
		POSTERO INFERIOR	8	67%	4	33%	12		
		POSTERO SUPERIOR	4	100%	0	0%	4		
	Total		20	80%	5	20%	25		

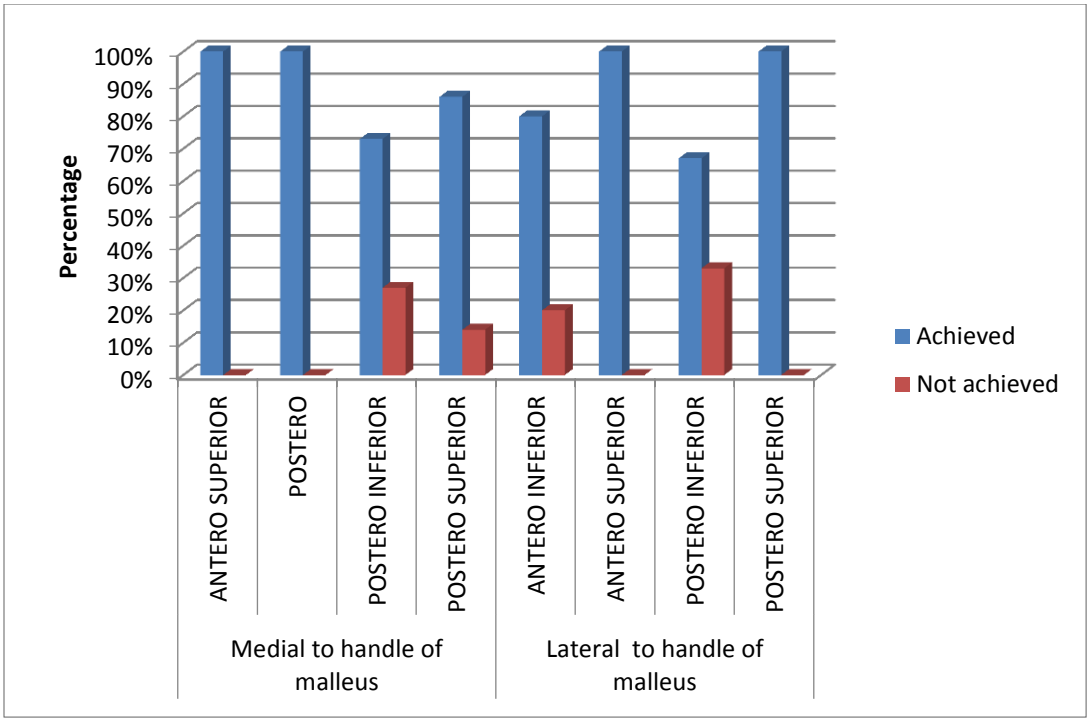
n=no. of patients

Hearing gain was recorded in 8(73%) potero inferior followed by 6(86%), 1(100%) antero superior and 1(100%) antero inferior perforations. P value=0.909. Hearing gain in 8(67%) postero inferior followed by 4(100%) postero superior, 4(80%) antero inferior and 2(100%) antero inferior perforation. P value-0.504

FIGURE 53

Correlation of hearing gain with location of perforation after 24th week of follow up in either technique

(n=50)



n=no. of patients

Hearing gain was recorded in 8(73%) potero inferior followed by 6(86%), 1(100%) antero superior and 1(100%) antero inferior perforations. P value=0.909. Hearing gain in 8(67%) postero inferior followed by 4(100%) postero superior, 4(80%) antero inferior and 2(100%) antero inferior perforation. P value-0.504

TABLE 44

Correlation of AB gap shift with location of perforation after 24th week of follow up in either technique

(n=50)

Group			AB GAP				Total	Chi-squre value	p-value
			IMPROVED		SAME				
MEDIAL	LOCATION		4	80%	1	20%	5	4.154	0.386
		ANTERO SUPERIOR	0	0%	1	100%	1		
		ANTERO INFERIOR	1	100%	0	0%	1		
		POSTERO INFERIOR	7	64%	4	36%	11		
		POSTERO SUPERIOR	6	86%	1	14%	7		
	Total		18	72%	7	28%	25		
LATERAL	LOCATION	ANTERO INFERIOR	3	60%	2	40%	5		
		ANTERO SUPERIOR	2	100%	0	0%	2		
		POSTERO INFERIOR	9	75%	3	25%	12		
		POSTERO SUPERIOR	4	100%	0	0%	4		
	Total		20	80%	5	20%	25		

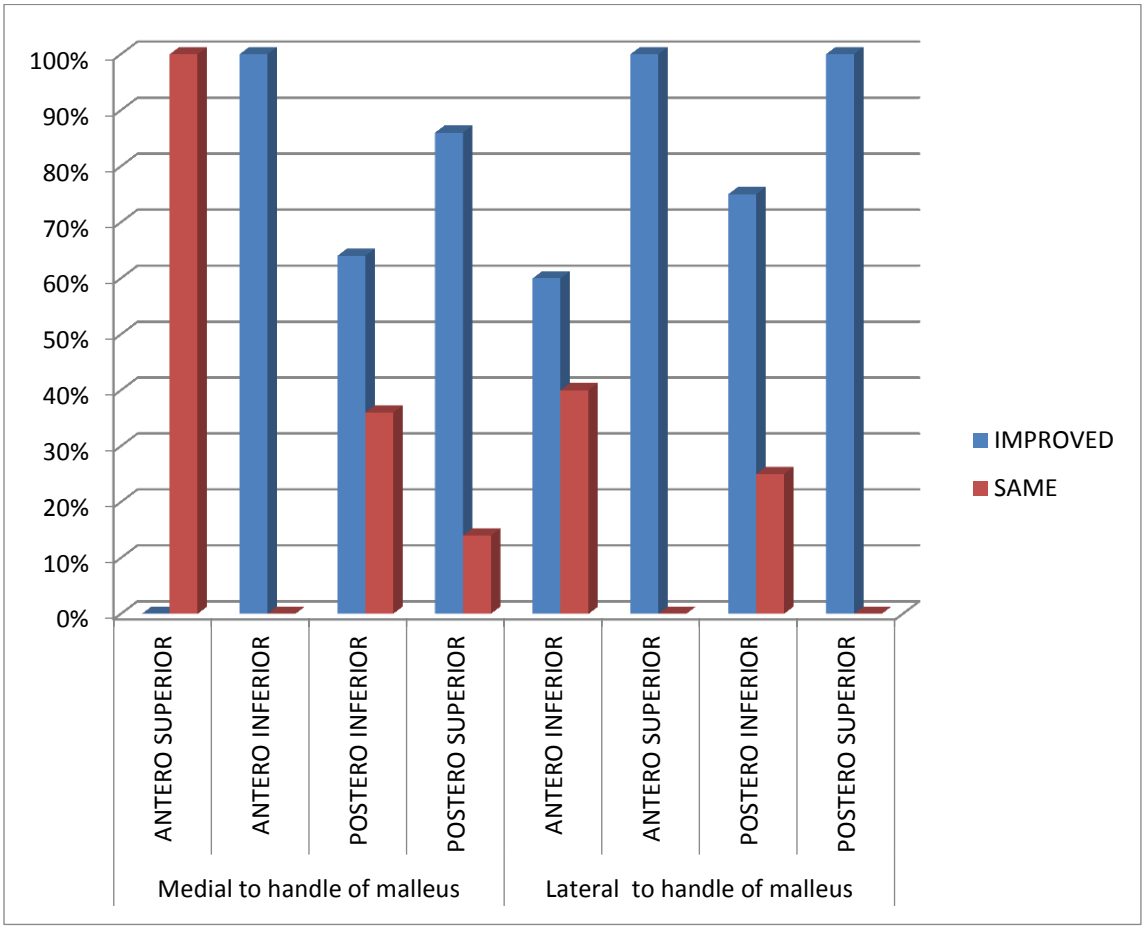
n=no. of patients

AB gap shift was noted in 7(64%) postero inferior, 6(86%) postero superior, 1 (100%) antero inferior perforation with graft placed medial to handle of malleus. AB gap shidt noted in 9(75%)postero inferior, 4(100%) postero superior, 3(60%) antero inferior and 2(100%) antero superior perforation with graft lateral to handle of malleus. P value=0.386.

FIGURE 54

Correlation of AB gap shift with location of perforation after 24th week of follow up in either technique

(n=50)



n=no. of patients

AB gap shift was noted in 7(64%) postero inferior, 6(86%) postero superior, 1 (100%) antero inferior perforation with graft placed medial to handle of malleus. AB gap shidt noted in 9(75%)postero inferior, 4(100%) postero superior, 3(60%) antero inferior and 2(100%) antero superior perforation with graft lateral to handle of malleus. P value=0.386.

TABLE 45

Correlation graft uptake, hearing gain and AB gap shift after 24th week of follow up in either technique

(n=50)

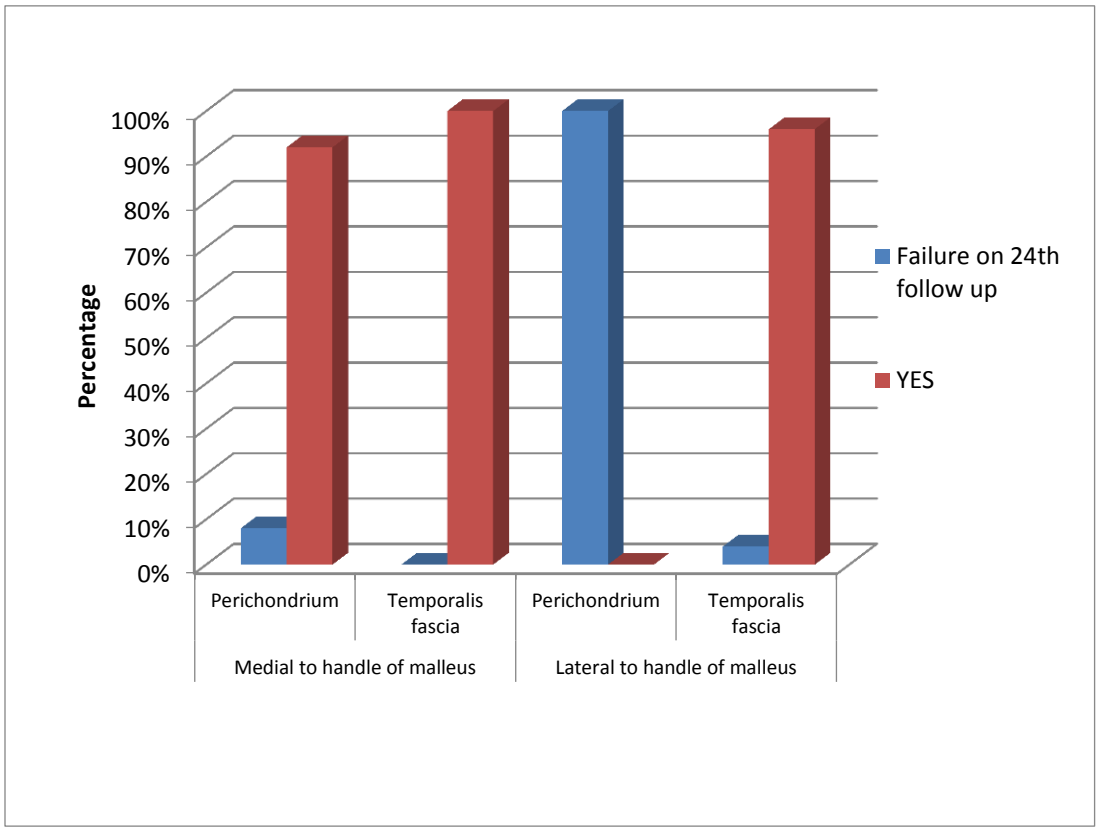
Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 24th follow up		YES				
Medial to handle of malleus	Graft material	Perichondrium	1	8%	12	92%	13	0.962	0.327
		Temporalis fascia	0	0%	12	100%	12		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	Graft material	Perichondrium	1	100%	0	0%	1	11.979	0.08
		Temporalis fascia	1	4%	23	96%	24		
	Total		2	8%	23	92%	25		
Group			HEARING GAIN				Total	Chi-squre value	p-value
			IMPROVED		NOT IMPROVED				
Medial to handle of malleus	Graft material	Perichondrium	10	77%	3	23%	13	0.160	0.689
		Temporalis fascia	10	83%	2	17%	12		
	Total		20	80%	5	20%	25		
Lateral to handle of malleus	Graft material	Perichondrium	0	0%	1	100%	1	4.167	0.2
		Temporalis fascia	20	83%	4	17%	24		
	Total		20	80%	5	20%	25		
Group			AB GAP				Total	Chi-squre value	p-value
			IMPROVED		SAME				
Medial to handle of malleus	Graft material	Perichondrium	9	69%	4	31%	13	0.103	0.748
		Temporalis fascia	9	75%	3	25%	12		
	Total		18	72%	7	28%	25		
Lateral to handle of malleus	Graft material	Perichondrium	0	0%	1	100%	1	4.167	0.200
		Temporalis fascia	20	83%	4	17%	24		
	Total		20	80%	5	20%	25		

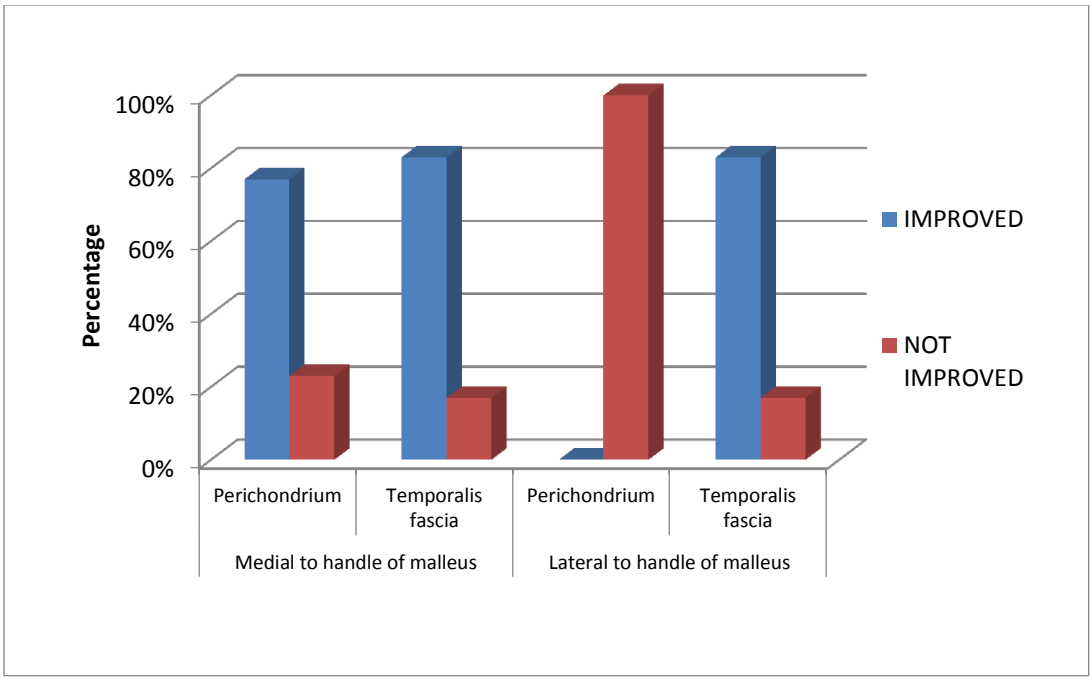
Graft uptake rate was seen in 12(100%) with temporalis fascia and 12(92%) with tragal perichondrium in graft medial to handle of malleus. P value=0.327. 23(96%) temporalis fascia with graft placed lateral to handle of malleus. P value=0.08. Hearing gain was improved in 10(83%) with temporalis fascia, 10(77%) with tragal perichondrium in graft medial to handle of malleus. P value=0.689. 20(83%) in temporalis fascia in graft placed lateral to handle of malleus. P value=0.2. AB gap shift was observed in 9(75%) temporalis fascia , 9(69%) tragal perichondrium with graft placed medial to handle of mallus. P value=0.748. 20(83%) in temporalis fascia with graft placed lateral to handle of malleus. P value=0.200

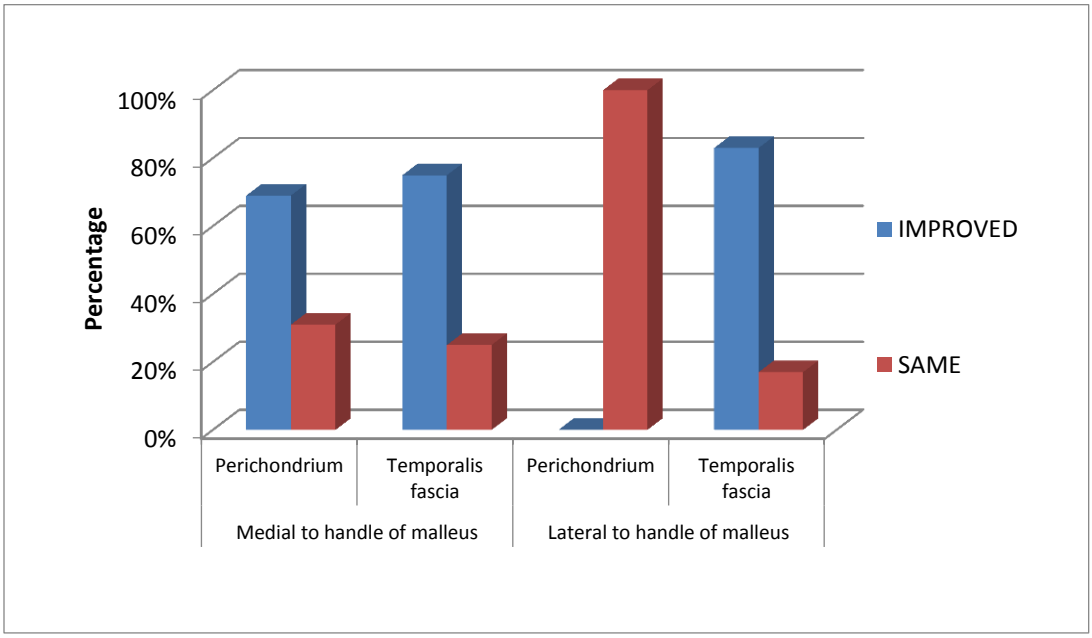
FIGURE 55

Correlation graft uptake, hearing gain and AB gap shift after 24th week of follow up in either technique

(n=50)







Graft uptake rate was seen in 12(100%) with temporalis fascia and 12(92%) with tragal perichondrium in graft medial to handle of malleus. P value=0.327. 23(96%) temporalis fascia with graft placed lateral to handle of malleus. P value=0.08. Hearing gain was improved in 10(83%) with temporalis fascia, 10(77%) with tragal perichondrium in graft medial to handle of malleus. P value=0.689. 20(83%) in temporalis fascia in graft

placed lateral to handle of malleus. P value=0.2. AB gap shift was observed in 9(75%) temporalis fascia , 9(69%) tragal perichondrium with graft placed medial to handle of mallus. P value=0.748. 20(83%) in temporalis fascia with graft placed lateral to handle of malleus. P value=0.200

TABLE 46

Correlation of graft uptake with canaloplasty after 24th week of follow up in either technique

(n=50)

Group			GRAFT UPTAKE				Total	Chi-squre value	p-value
			Failure on 24th week follow up		Succesful				
Medial to handle of malleus	Canaloplasty	DONE	0	0%	2	100%	2	0.091	0.763
		NOT DONE	1	4%	22	96%	23		
	Total		1	4%	24	96%	25		
Lateral to handle of malleus	Canaloplasty	DONE	0	0%	3	100%	3	0.296	0.586
		NOT DONE	2	9%	20	91%	22		
	Total		2	8%	23	92%	25		

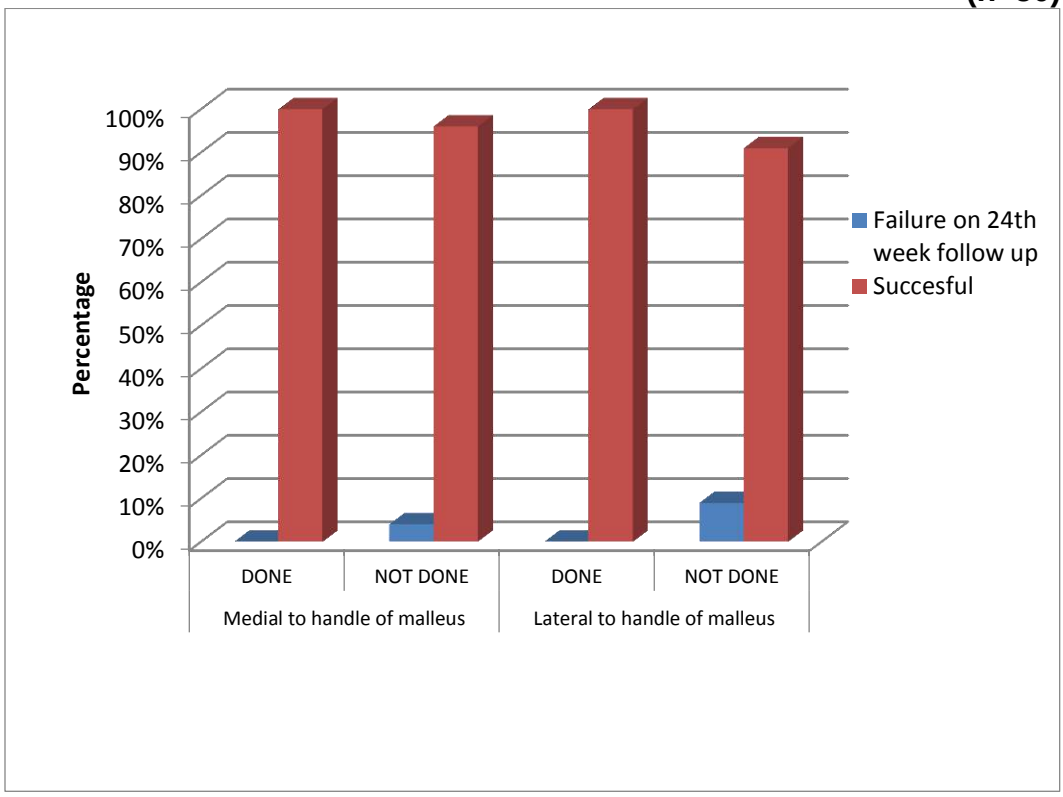
n=no. of patients

Graft uptake was noted in 2(100%) patients in which canaloplasty done. P value=0.763. graft uptake in 3(100%) patients in which canaloplasty done. P value=0.586

FIGURE 56

Correlation of graft uptake with canaloplasty after 24th week of follow up in either technique

(n=50)



n=no. of patients

Graft uptake was noted in 2(100%) patients in which canaloplasty done. P value=0.763. graft uptake in 3(100%) patients in which canaloplasty done. P value=0.586

COMPARATIVE SUMMARY

	DMCH Study (Nov2018-April 2020)		World Literature			
Parameter	**No. of patients**	**outcome**	**Study group**	**Year**	**No. of patients**	**Outcome**
Demographic profile						
Mean age of patients	50	34.58 years	Mehrdad Rogha et al[98] Erkan Kulduk et al[99]	2014 2015	56	33years 29.40 ± 10.14 years
Gender ratio (female: male)	50	1.7:1 (F:M)	Erkan Kulduk et al[99]	2015	114	1.4:1 (F:M)
Clinical profile						
Otorrhoea & hearing impairment	50	40 (80%)	Heung-Yeup Lee[95] Erkan Kulduk et al[99]	2010 2015	412 114	98% 100%
Etiology (ASOM)	50	47 (94%)	Vergison A et al[53] Erkan Kulduk et al[99]	2010 2015	100 114	89% 100%
Consistency of otorrhoea	50	21 (52.5%) Muco-purulent	Masoud Naderpour et al[96]	2014	60	30(50%)
Size of perforation	50	38 (76%) large and medium each	Erkan Kulduk et al[99]	2015	114	50%

COMPARATIVE SUMMARY

	DMCH Study (Nov2018-April 2020)		World Literature			
Operative profile						
Anaesthesis	50	General anaesthesia	Timothy T et al[83] **Islam Ma et al[113]**	2006 2020	200 7905	GA LA
Technique	50	25:25 (medialisation: lateralisation	Rogha M et al[98] Erkan Kulduk et al[99]	2015	56	28:28
Overall graft uptake rate	50	47(94%)	Erkan Kulduk et al[99] Rogha M et al[98] M Landa Aranzábal et al[112]	2015 2014 1996	114 56 460	89.8% 94.64% 80%
Overall hearing gain	50	40(80%)	M Landa Aranzábal et al[112] Erkan Kulduk et al[99] M Landa Aranzábal et al[112]	1996 2015 1996	460 114 460	64% 91.5 % 64%
Overall AB gap shift	50	37(74%)	Erkan Kulduk et al[99]	2015	114	96(84%)
Graft uptake (medialisation:lateralisatio)	50	24:23(96%:92 %)	Rogha M et al[98] Erkan Kulduk et al[99]	2014 2015	56 114	96.42%:92.85% 89.1 %: 90.5 %
Graft uptake in realtion to size of perforation	50	2 failure in large, 1 in medium size perforation	Timothy T et al[83] P Lee et al[93]	2005 2002	100 423	97% 74.1% (Small) 56% (Large)
Graft uptake in relation with canalplasty	50	100%	M.D. Prakash et al[106]	2018	100	98%

DISCUSSION

Chronic suppurative otitis media is a chronic and persistent disease which is insidious in onset and can cause severe deafness with irreversible sequelae shenoi, 1987. Tympanoplasty in adults has high success rate and easy to performe and improves the quality of life of those operated upon Podoshin and Fradis et al.,1996.[107]

50 patients between the age group of 8-66 years, of either gender with the chief complaint of ear discharge and conductive hearing loss were selected from the ENT, outpatient Department of Dayanand Medical College & Hospital Ludhiana. A complete work up (as per the proforma attached) was carried out. Every possible sources of infection from the throat, nose and paranasal sinuses were treated by conservative treatment, antibiotics, antihistamines, steroids as the case may be.

Minimum age among these patients was 8 years and maximum age is 66 years. Maximum number of patients are in the age group of 21-30 years 3(26%) followed by 41-50 years12(24%). Mean age was 34.58. A study conducted by Erkan Kulduk et al in 2015 on 114 patients in which mean age was 29.40 ± 10.14 years. [99]

Overall success rate of graft uptake by either technique at the 24th week of follow up in our series of 50 patients was 94% i.e in 47 patients. . A study conducted in 1994 by Kessler, in relation to the surgical success rate and reperforation in tympanoplasty, they have concluded that tympanoplasty may be conducted irrespective of age. [109]

Vartiainen and Nuutinen 1993 their study of 404 primary tympanoplasty concluded that age of the patient did not affect success rate. [108] Gersdorff and Gaun P. 1995 study of long term results after myringoplasty, showed that the results of myringoplasty are better in adults. In this study all 3(6%) failures of graft uptake noted in females, that's may be because of females 32(64%) outnumbered males 18(36%).

28 (56%) patents belongs to rural and 22 (44%) patients belongs to urban background. All the 50 patients presented with complaint of ear discharge

or hearing impairment. With time rural population becoming more aware and follow the instructions given time and again and came for follow up proper on time because in this study only 1(2%) rural and 2(4%) from urban area has noted with failure of graft uptake.

Most of the patients 47 (94%) patients had history of acute suppurative otitis media. History of trauma was in 1 (2%) and in 2 (4%) patients there were nothing. All 3(6%) failure of graft uptake noted in patients with history of acute supporative otitis media as etiological factor.

21(42%) patients had mucopurulent, 14(28%) with purulent, 5(10%) had mucoid discharge and 10(20%) patients had dry ear. In this study 2(4%) with mucopurulent and 1(2%) purulent discharge patients had failure of graft uptake. This shows some significance on outcome may depends on type of discharge in pre operative period. But a study conducted in 1996 by House et al. 62% ears were dry at the time of surgery while 23% had mucoid discharge and 15% had purulent discharge but they concluded that type of discharge was not a significant factor in the outcome of surgery. Hassard et al 1980 and Adkins and white 1984 and ophir et al. 1987 concluded that status of middle ear mucosa whether dry, mucoid or mucopurulent was not significant in the surgical outcome, this Fact is also supported by John W. House et al.1995 in their 10 year experience on tympanoplasty. In present study 3 graft failure were seen in mucopurulent and purulent discharging ears. [110,111]

At 6th week of follow up all 50(100%) patients show uptake of graft. At 12th week of follow up there is 1 (2%) failure and at 24th week of follow up 3(6%) failure of graft uptake noted in our series of 50 patients.Overall success rate of hearing improvement by either technique at 6th week in 35(70%), at 12th week and at 24th week in 40(80%). Overall success rate in AB gap improvement by either technique in 37(74%). On 24th week of follow up graft uptake was 24(96%) medialisation and 23(92%) lateralization tympanoplasty. 1(4%) failure of graft uptake in medialisation and 2(8%) in lateralization technique of tympanoplasty.Overall hearing

gain was noted in 80% of patients by either technique. Hearing gain was equal in both groups i.e 80%. AB gap shift was 13(52%) with medialisation and 6(25%) with lateralization tympanoplasty. A study conducted by Rogha M, Berjis N in 2014 with two grups group A and Group B contained 28 patients in Group A and 28 in Group B. Overall success rate was 94.64% that was 96.42% in Group A(malleus medialisation), and 92.85% in Group B(malleus lateralization). Differences of air-bone gap in each group before and after surgery was 16.10 (±4.89) in Group A, and 15.78 (±3.40) in Group B. Improvement of hearing level was not significant between two surgical methods. [103]

In the graft placement medial to handle of malleus, females showed 94% graft uptake i.e 16 out of 17and males showed 100% uptake i.e 8 out of 8.In graft placement lateral to handle of malleus, females showed 88% graft uptake i.e 14 ou of 16 and males showed 100% i.e 9 out of 9. Robert J Yawn and Matthew L Carlson in 2014 conducted a study on 141 patients and noticed that there were good success rate of graft uptake in all patients after long follow up period and concluded that there is no significant difference of outcome in two different techniques of tympanoplasty. [100]

Hearing gain in 14(82%)females and in 6(75%) males with medialisation tympanoplasty. Hearing gain in 12(75%) females and 4(25%) males with lateralization tympanoplasty. In 14(82%) females and 4(50%) males AB gap shift is noted in patients with graft placed medial to handle of malleus. 12(75%) females and 8(89%) males AB gap shift is noted in patients with graft placed lateral to handle of malleus.

Graft uptake is 10(91%)large followed by 8(100%)medium, 5(100%) sub-total and 1(100%) small size of perforation. Graft uptake in 9(90%) medium followed by 7(88%) large, 4(100%) small, 2(100%) sub-total and 1(100%) in marginal perforation. 3(6%) failure of graft uptake noted with history of large and medium size perforations in this study. Sheehy and Anderson 1980, Sade et al. 1981 and Ophir et al. 1987 recorded reduced

success rates with large perforations irrespective of the technique. [42][58] Aranzabal and Rodriguez et al. 1996 reported that there was no difference in success with site, size, cause or previous operation. [112]

Graft uptake in 10(91%) postero-inferior quadrent perforation and 100% in all other locaton perforation with graft placed medial to handle of malleus. Graft uptake in 4(100%) antero-inferior , 2(100%) antero superior, 11(92%) postero superior and 4(80%) antero inferior perforation with graft placed lateral to handle of malleus. Thus the results of the present study in terms of graft uptake in various sites of perforation of tympanic membrane are comparable to those of Wayne et al. 1990, Sanda, Aranzabal M and Vartiainen E. 1996. The most 89 probable factor responsible for failures might be inadequate anterior tucking, anterior blunting, inadequate margins or complicity of eustachian tube functions. [111]

Hearing gain in 8(73%) potero inferior followed by 6(86%), 1(100%) antero superior and 1(100%) antero inferior perforation with graft placed medial to handle of malleus. Hearing gain in 8(67%) postero inferior followed by 4(100%) postero superior, 4(80%) antero inferior and 2(100%) antero inferior perforation with graft placed lateral to handle of malleus.

0-10db of AB gap shift noted in 1 medialisation and 6 lateralisation tympanoplasty. 11-20 db shift noted in 11 medialisation and 14 lateralisation, 21-30 db of shift noted in 4 medialisation and 1 lateralisation tympanoplasty. AB gap shift noted in 7(64%) postero inferior, 6(86%) postero superior, 1(100%) antero inferior perforation with graft medial to handle of malleus. AB gap shift noted in 9(75%)postero inferior, 4(100%) postero superior, 3(60%) antero inferior and 2(100%) antero superior perforation with graft lateral to handle of malleus. Saeed I, Akhlaq M conducted a study in 2014 and concluded that there is no significant difference of air bone gap shift in two different techniques of tympanoplasty. [101]

Graft uptake rate in 12(100%) with temporalis fascia and 12(92%) with tragal perichondrium in graft medial to handle of malleus. 23(96%)

temporalis fascia with graft placed lateral to handle of malleus. Hearing gain is improved in 10(83%) with temporalis fascia, 10(77%) with tragal perichondrium in graft medial to handle of malleus. 20(83%) in temporalis fascia in graft placed lateral to handle of malleus. AB gap shift is observed in 9(75%) temporalis fascia , 9(69%) tragal perichondrium with graft placed medial to handle of malleus. 20(83%) in temporalis fascia with graft placed lateral to handle of malleus. Rogha M, Berjis N, in there study conducted in 2014, concluded that both techniques i.e graft placed medial and lateral to malleus handle are effective with success rates in view of graft uptake and AB gap shift 96.42% and 92.85% respectively and that is also observed in this study. [103]

Graft uptake in 2(100%) patients in which canaloplasty done. Graft uptake in 3(100%) patients in which canaloplasty done. A study conducted by M. D. Prakash, Priya Badkar in 2018 showed, if we combine canalplasty with tympanoplasty as it gives better visualisation of tympanic membrane facilitating the placement of graft and prevents lateralization of the graft and gives better results in view of graft uptake , hearing gain and AB gap shift. [106]

SUMMARY AND CONCLUSION

- 50 patients between the age group of 8-66 years, of either gender with the chief complaint of ear discharge and conductive hearing loss were selected from the ENT, outpatient Department of Dayanand Medical College & Hospital Ludhiana. 25 patients were taken in each group of study i.e group A medialisation tympanoplasty and group B lateralization tympanoplasty.
- Minimum age among these patients was 8 years and maximum age is 66 years. Maximum number of patients are in the age group of 21-30 years 3(26%) followed by 41-50 years12(24%). Mean age was 34.58.
- There were more 32(64%) than males 18(36%). The females outnumbers in the ratio. Graft uptake was in 16(94%) females and 8(100%) males with graft placed medial to handle of malleus. Graft uptake in14(88%) females and 9(100%) males with graft placed lateral to handle of malleus.
- 28 (56%) patents belongs to rural and 22 (44%) patients belongs to urban background. All the 50 patients presented with complaint of ear discharge or hearing impairment. Graft uptake failure was noted in 1(2%) rural and 2(4%) from urban background patient.
- 42 (84%) had otorrhoes, 44 (88%) presented with hearing impairment and 40 (80%) had both ear discharge as well as hearing deficit.
- 47 (94%) patients had history of acute suppurative otitis media.
- Majority 21(42%) patients had mucopurulent ,14(28%) with purulent, 5(10%) had mucoid discharge and 10(20%) patients had dry ear. In this study 2(4%) with mucopurulent and 1(2%) purulent discharge patients had failure of graft uptake.
- Staphylococcus aureus was the organism cultured in majority 13(32.5%), streptococcus pneumoniae ,pseudomonas 8(20%) each acinetobacter 5(12.5%) and 6(15%) had no growth on aural swab culture and sensitivity.

- Graft uptake is 10(91%)large followed by 8(100%)medium, 5(100%) sub-total and 1(100%) small size of perforation. Graft uptake in 9(90%) medium followed by 7(88%) large, 4(100%) small, 2(100%) sub-total and 1(100%) in marginal perforation. 3(6%) failure of graft uptake noted with history of large and medium size perforations in this study.
- 25 (50%) patients were operated via postaural, 21 (42%) endaural and 4 (8%) via permeatal approach.
- In 43 (86%) patents all margins of perforation were seen and in 7 (14%) patients all margins were not seen. Canalplasty was undertaken in 5 (10%) patients.
- At 6th week of follow up all 50 (100%) patients show uptake of graft. At 12th week of follow up there is 1 (2%) failure and at 24th week of follow up 3 (6%) failure of graft uptake noted in our series of 50 patients by either technique.
- On 24th week of follow up graft uptake was 24(96%) medialisation and 23 (92%) lateralization tympanoplasty. 1(4%) failure of graft uptake in medialisation and 2(8%) in lateralization technique of tympanoplasty.
- Overall hearing gain was noted in 80% of patients by either technique. Hearing gain was equal in both groups i.e 80%.
- AB gap shift was 18(72%) with medialisation and 21(82%) with lateralization tympanoplasty.

CONCLUSION

In the present study:

- Medialisation technique gave best results in terms of graft uptake and hearing gain.
- Overall graft uptake rate was 96% by either rechnique.
- In medialisation technique 96% and by lateralization technique graft uptake rate was 92%.
- Overall hearing was 80%, i.e. equal in both medialisation and lateralization technique i.e 80%.
- We recommend medialisation tympanoplasty over lteralisation Tympanoplasty in chronic safe perforation or tubotympanic pathology.

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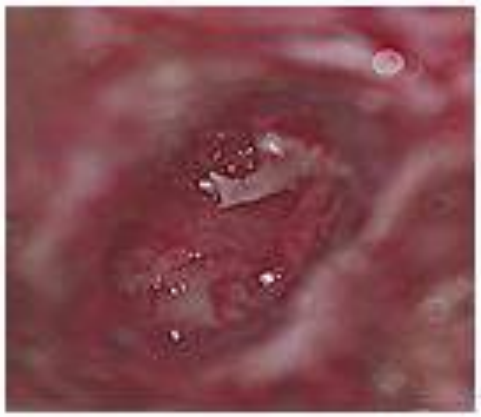
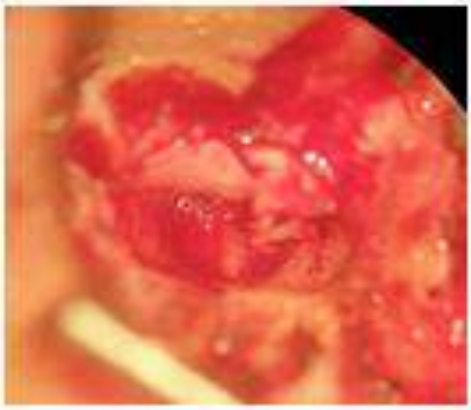
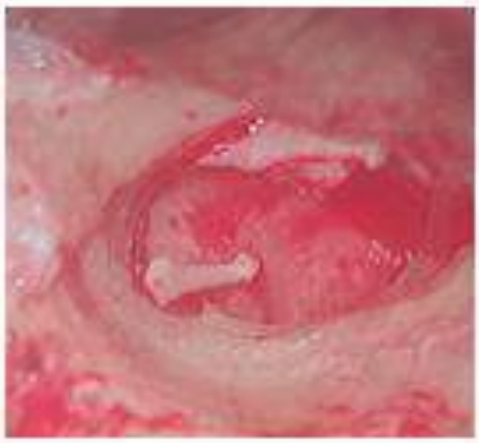
Pictures of Different Perforations (dry & wet)

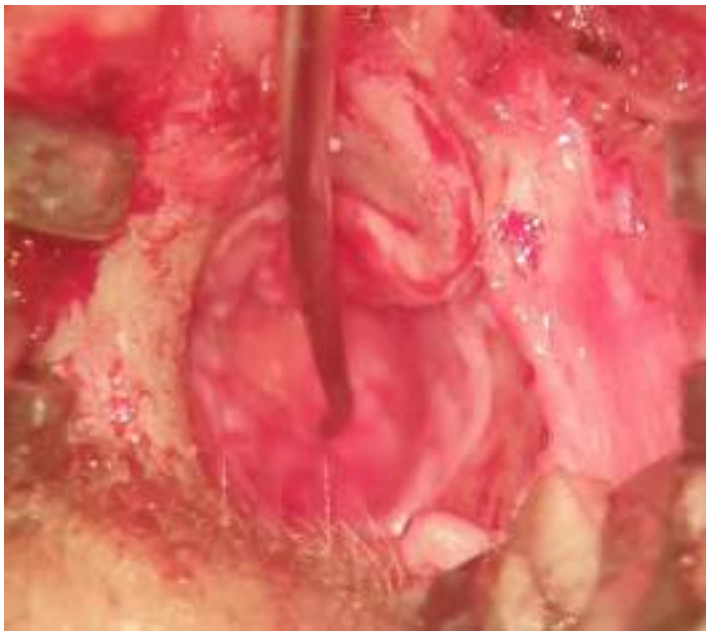
Pictures of handle of malleus after raising the tympanomeatal flap

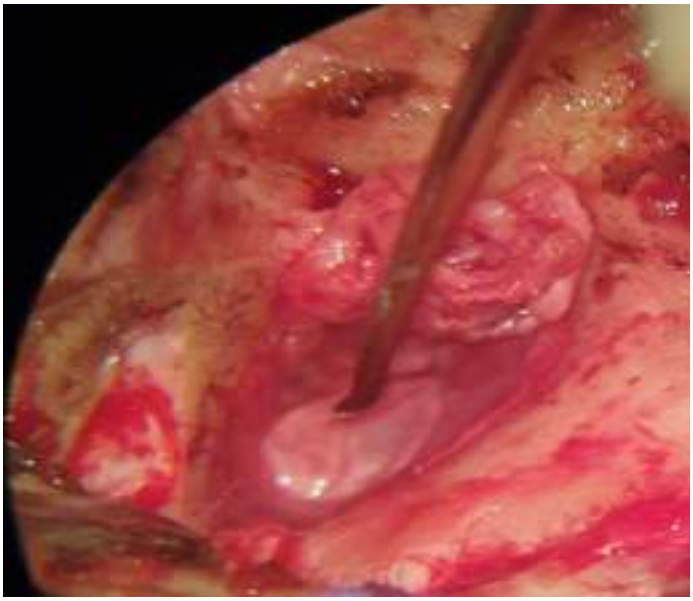




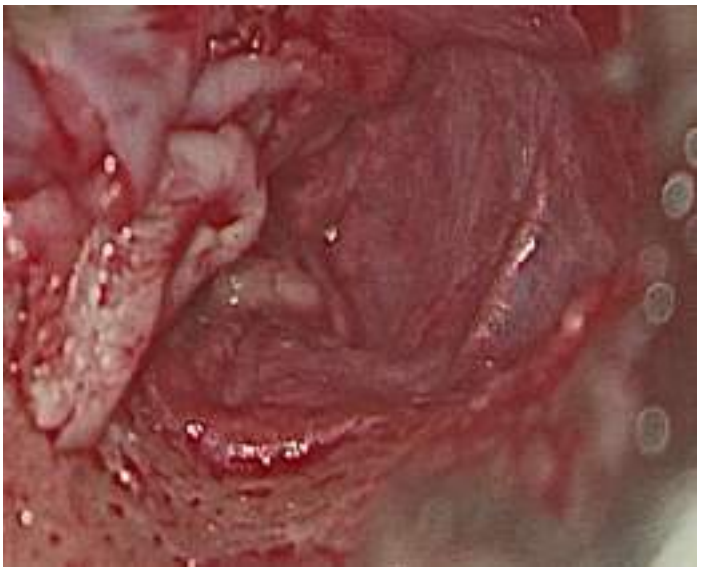


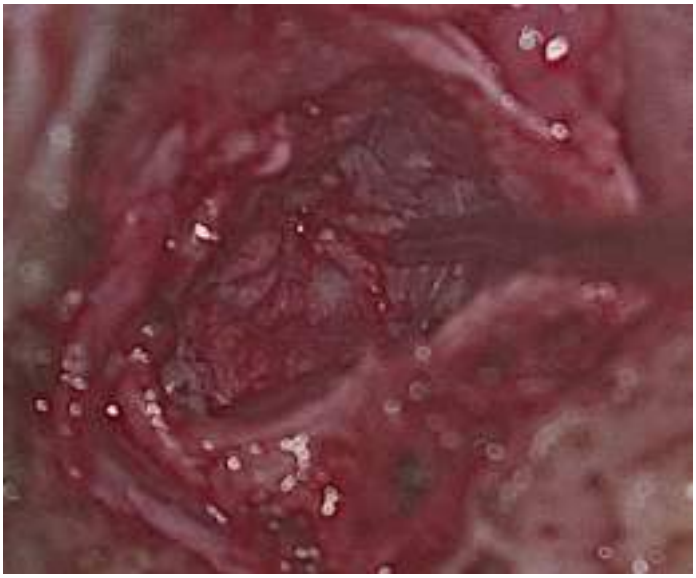
Graft placement lateral to the handle of malleus





Graft placement medial to the handle of malleus

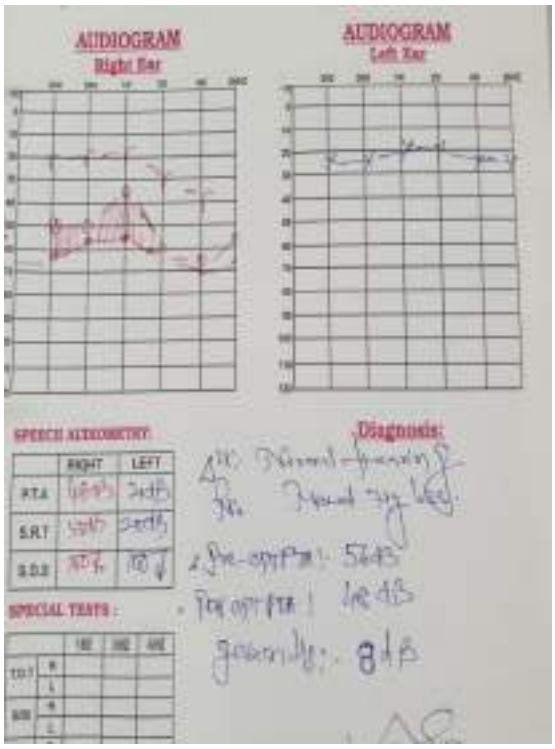


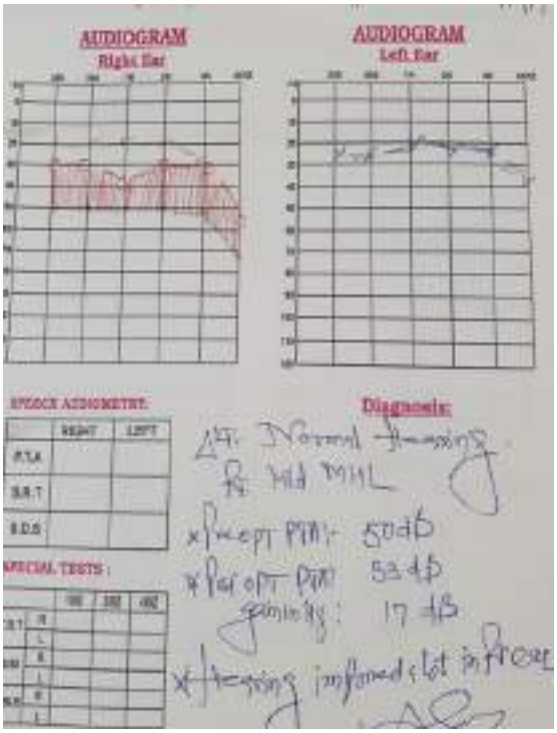


Post operative pictures of tympanic membeane at 6th, 12th and 24th week follow up (Malleus medialisation)

Post-operative PTA shows hearing gain and AB gap shift

(Malleus medialisation)

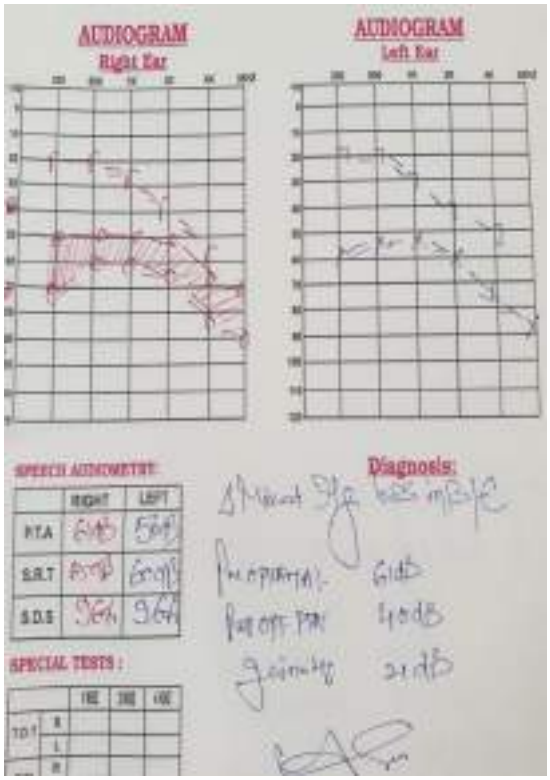


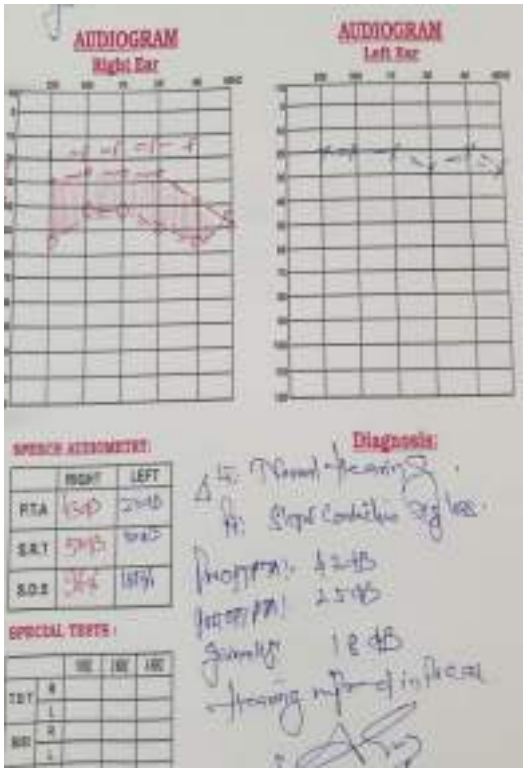


Post-operative pictures of tympanic membrane at 6th, 12th and 24th week of follow up (Malleus medialisation)

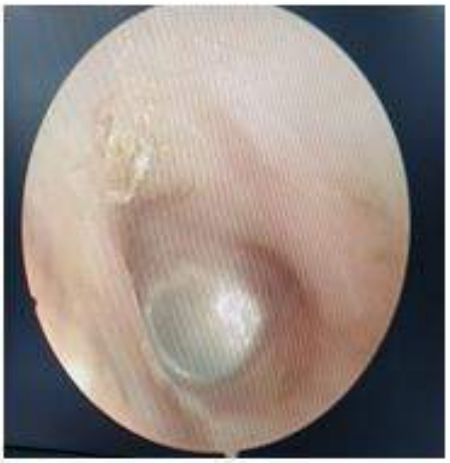
Post-operative PTA show hearing gain and AB gap shift

(Malleus medialisation)



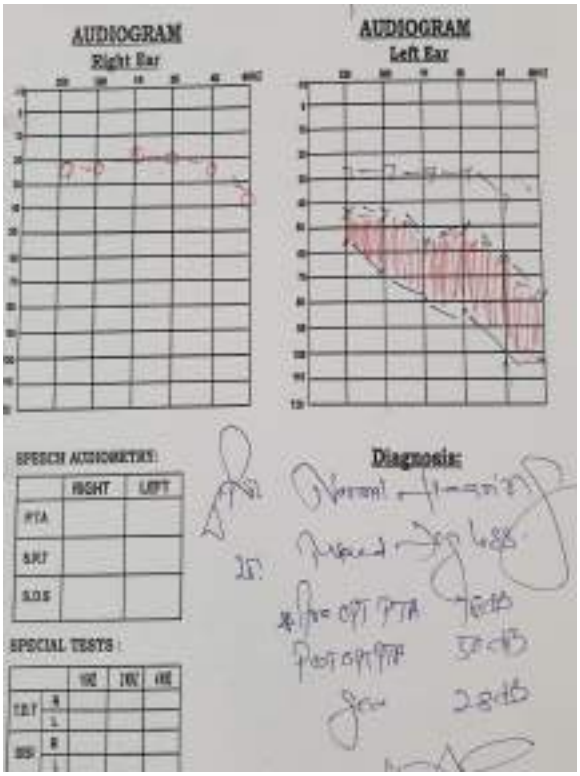


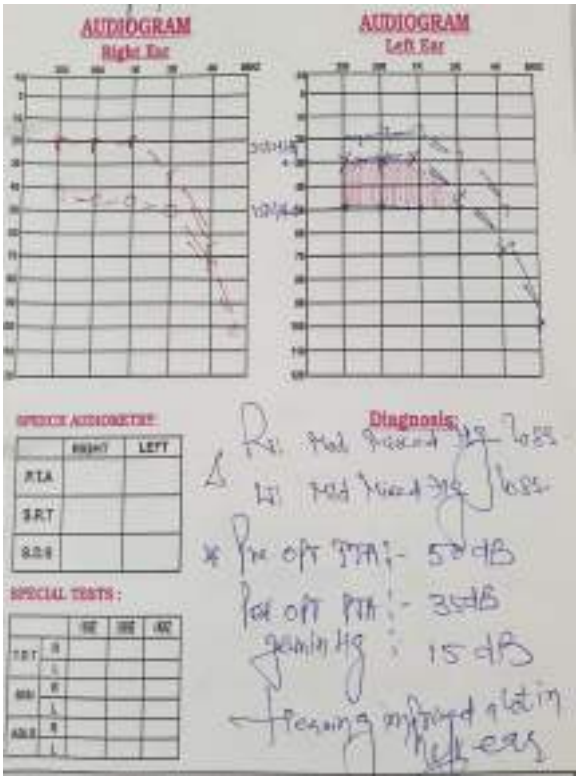
Post operative pictutres of tympanic membrane at 6th, 12th and 24th week of follow up (Malleus lateralisation)



Post-operative PTA shows hearing gain and AB gap shift

(Malleus lateralisation)

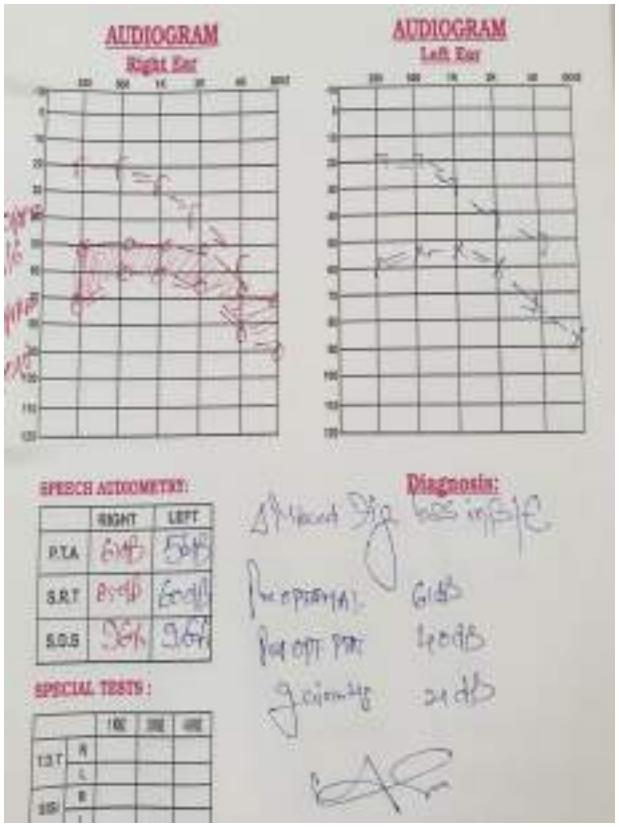


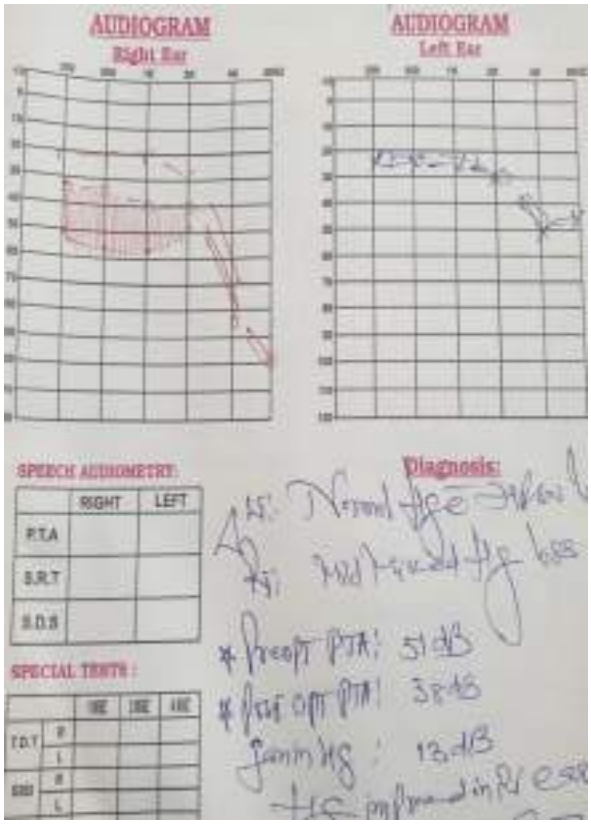


Post-operative pictures of tympanic membrane at 6th, 12th and 24th week of follow up (Malleus lateralisation)

Post-operative PTA shows hearing gain and AB gap shift

(Malleus lateralisation)





PROFORMA

Sr. No.

NAME AGE/SEX

ADMISSION NO. CR. NO.

DOA DOD

ADDRESS

CHIEF COMPLAINTS

DISCHARGE DURATION

HEARING LOSS DURATION

HISTORY

H/O TRAUMA/ASOM

H/O EAR DROP INSTILLATION YES/NO

IF YES (COMPOSITION)

H/O EAR DISCHARGE

IF YES COLOUR YES/NO

SMELL

CONSISTENCY

C/S REPORT- ORGANISM SENSITIVITY

LAB. REPORTS DMC/OUTSIDE

PERFORATION

SIZE OF PERFORATION

SHAPE OF PERFORATION

SADE GRADE OF PERFORATION

DIAGRAM

Signature of Candidate **Signature of Supervisor**

MARGINS OF PERFORATION

1. INVERTED/EVERTED
2. ALL MARGINS SEEN
3. ALL MARGINS NOT SEEN
    a) Anterior
    b) Antero-inferior
    c) Antero-superior
    d) Superior
    e) Posterior
    f) Postero- inferior
    g) Postero-superior

- GRANULOMA ON MARGINS YES/NO
- ANY OSSICLES SEEN

  MALLEUS- LONG PROCESS/UMBO/HEAD

  INCUDOSTAPEDIAL JOINT

  STAPES SUPRASTRUCTUR/FOOTPLATE

AUDIOGRAM **R/E** **L/E**

- PREOPERATIVE PTA
- A-B GAP IN PTA
- AC LEVEL
- BC LEVEL

OPERATION UNDER LA

GA

MAC

Signature of Candidate **Signature of Supervisor**

APPROACH

- POST-AURAL
- ENDAURAL
- TRANSCANAL PERMEATAL

INTRAOPERATIVE STATUS

	Graft placed medial to handle of malleus	Graft placed lateral to handle of malleus
Procedure Name		
Procedure Findings		

Signature of Candidate **Signature of Supervisor**

POST OPERATIVE FOLLOW UP

EUM (Graft status)	6wks	12wks	24wks
PTA	6wks	12wks	24wks

Signature of Candidate **Signature of Supervisor**

Sr. No	NAME	AGE	GENDER	RURAL	C/C	DURATION	ETIOLOGY	E. DROPS	CHARACTER	ODOUR	CONSISTANCY	C/S REPORT
1	GK	40	F	URBAN	DIS 25	25	ASOM	CIPRO	YELLOW	-	PURULENT	STAPH AUREUS
2	LS	18	M	RURAL	DIS 3	3	ASOM	CIPRO	YELLOW	-	PURULENT	STAPH AUREUS
3	PA	27	F	URBAN	DIS/HL 10	10	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	PSEUDOMONAS
4	BK	35	F	RURAL	HL 18	18	ASOM	NO	NO DISCHARGE	-	-	-
5	K	12	F	URBAN	DIS 5	5	ASOM	CIPRO	YELLOW	-	PURULENT	PSEUDOMONAS
6	SL	28	M	URBAN	DIS/HL	28	ASOM	CIPRO	YELLOW	-	PURULENT	PSEUDOMONAS
7	JK	66	F	RURAL	DIS/HL	15	ASOM	M FLOX	YELLOW	FOUL	MUCOPURULENT	STAPH AUREUS
8	VS	18	M	RURAL	HL	2	TRAUMA	NO	NO DISCHARGE	-	-	-
9	N	18	M	RURAL	DIS/HL	3 M	NOT KNOWN	CIPRO	WATERY	-	PURULENT	PSEUDOMONAS
10	RB	22	F	RURAL	DIS/HL	22	ASOM	M FLOX	YELLOW	FOUL	MUCOPURULENT	STAPH AUREUS
11	PS	40	F	URBAN	DIS	1 Y	ASOM	M FLOX	YELLOW	-	PURULENT	ACINETOBACTER
12	MK	27	F	RURAL	DS/HL	5 M	ASOM	CIPRO	WATERY	-	-	-
13	JK	50	F	RURAL	HL	5 Y	ASOM	NO	NO DISCHARGE	-	-	-
14	SK	19	F	RURAL	DS/HL	10 Y	ASOM	CIPRO	YELLOW	-	PURULENT	STAPH AUREUS
15	RK	30	F	RURAL	DIS 3	3 Y	ASOM	POLY M	YELLOW	-	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
16	BK	44	F	RURAL	DIS/HL	1 Y	ASOM	POLY M	WATERY	-	MUCOPURULENT	STAPH AUREUS
17	JK	23	F	RURAL	B/L DIS	2 Y	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	STAPH AUREUS
18	JS	44	M	RURAL	B/L DIS	5 Y	ASOM	CIP+CLOTT	YELLOW	-	MUCOPURULENT	-
19	GS	26	M	RURAL	DIS/HL	4 Y	ASOM	CIP+CLOTR	YELLOW	-	MUCOPURULENT	-
20	LK	39	F	RURAL	DIS	2 Y	ASOM	POLY M	WATERY	-	-	-
21	A	41	F	URBAN	DIS/HL	5 Y	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
22	G	33	F	URBAN	DIS/HL	3 M	ASOM	CIP+CLOTRI	YELLOW	FOUL	MUCOPURULENT	PSEUDOMONAS
23	ML	52	M	URBAN	B/L HL	10 Y	ASOM	NO	NO DISCHARGE	-	-	-
24	HK	44	F	RURAL	DIS	1 Y	ASOM	CIP+CLOT	WATERY	FOUL	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
25	M	19	M	RURAL	HL	6 M	ASOM	NO	NO DISCHARGE	-	-	-
26	S	19	F	URBAN	DIS/HL	8 Y	ASOM	CIPRO	YELLOW	-	MUCOPURULENT	PSEUDOMONAS
27	G	8	F	URBAN	DIS/HL	3 Y	ASOM	CIP+CLOT	WAYERY	-	MUCOID	ACINETOBACTER
28	AR	50	F	URBAN	DIS/HL	20 Y	NOT KNOWN	CIPRO	YELLOW	FOUL	MUCOPURULENT	STAPH AUREUS
29	SA	18	M	URBAN	DIS	1 Y	ASOM	CIPRO	WATERY	-	MUCOID	STAPH AUREUS
30	SK	44	F	URBAN	DIS/HL	25 Y	ASOM	CIP+CLOT	YELLOW	-	MUCOPURULENT	STAPH AUREUS
31	NS	28	M	RURAL	DIS	10 Y	ASOM	CIPRO	MUCOID	-	MUCOID	ACINETOBACTER
32	S	33	F	URBAN	HL	4 Y	ASOM	NO	NO DISCHARGE	-	-	-
33	SS	41	M	RURAL	DIS/HL	2 Y	ASOM	POLYMIX	YELLOW	FOUL	MUCOPURULENT	PSEUDOMONAS
34	DSD	36	M	RURAL	HL	1 Y	ASOM	NO	NO DISCHARGE	-	-	-
35	SN	43	M	URBAN	DIS	1 M	ASOM	NO	NO DISCHARGE	-	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
36	A	54	E	URBAN	DIS/HL	10 Y	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
37	SK	28	F	RURAL	DIS	1.5 Y	ASOM	POLYMIX	YELLOW	FOUL	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
38	SM	43	M	URBAN	DIS/HL	20 Y	ASOM	CIPRO	YELLOW	-	PURULENT	STAPH AUREUS
39	JK	24	F	RURAL	DIS	3 Y	ASOM	CIPORO	YELLOW	-	MUCOPURULENT	-
40	JK	45	F	RURAL	DIS/HL	3 M	ASOM	POLYMIX	YELLOW	-	PURULENT	STAPH AUREUS

Sr. No	NAME	PERFORATION				PTA	AB GAP	ANAESTHESIA	GRAFT MATERIAL	APPROACH
		SIZE	MARGINS	LOCATION	GRANULOMA					
1	GK	LARGE	ALL SEEN	POSTERO INFERIOR	NO	68DB	30	GA	TFG	EA(ENDAURAL)
2	LS	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	48DB	20	GA	TFG	EA
3	PA	LARGE	ALL SEEN	POSTERO SUPERIOR	NO	48DB	30	GA	PG	-
4	BK	LARGE	ALL SEEN	POSTERO INFERIOR	NO	52DB	20	GA	TFG	EA
5	K	LARGE	ALL SEEN	POSTERO INFERIOR	PRESENT	60DB	30	GA	PG	TC(TRANS CANAL)
6	SL	MEDIUM	ALL SEEN	POSTERO SUPERIOR	PRESENT	48DB	30	GA	PG	TC
7	JK	S.TOTAL	ALL SEEN	-	NO	62DB	30	GA	TFG	EA
8	VS	SMALL	ALL SEEN	ANTERO SUPERIOR	NO	38DB	20	GA	TFG	EA
9	N	SMALL	ALL SEEN	ANTERO INFERIOR	NO	36DB	20	GA	TFG	EA
10	RB	LARGE	NOT SEEN	POSTERO INFERIOR	NO	38DB	20	GA	TFG	EA
11	PS	LARGE	NOT SEEN	POSTERO INFERIOR	NO	42DB	20	GA	TFG	EA
12	MK	S.TOTAL	ALL SEEN	-	NO	27DB	15	GA	TFG	EA
13	JK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	PRESENT	51DB	30	GA	PG	PA(POST AURAL)
14	SK	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	42DB	20	GA	TFG	EA
15	RK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	38DB	20	GA	PG	PA
16	BK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	60DB	36	GA	TFG	EA
17	JK	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	32DB	20	GA	PG	PA
18	JS	SMALL	ALL SEEN	ANTERO INFERIOR	NO	38DB	20	GA	TFG	EA
19	GS	LARGE	NOT SEEN	POSTERO INFERIOR	NO	43DB	20	GA	TFG	EA
20	LK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	41DB	20	GA	TFG	EA
21	A	LARGE	ALL SEEN	POSTERO INFERIOR	NO	48DB	30	GA	PG	PA
22	G	LARGE	ALL SEEN	POSTERO INFERIOR	NO	48DB	20	GA	PG	PA
23	ML	LARGE	NOT SEEN	POSTERO INFERIOR	NO	48DB	20	GA	TFG	EA
24	HK	MEDIUM	ALL SEEN	ANTERO INFERIOR	NO	45DB	20	GA	TFG	PA
25	M	SMALL	ALL SEEN	ANTERO SUPERIOR	NO	32DB	15	GA	TFG	EA
26	S	LARGE	ALL SEEN	POSTERO	NO	32DB	20	GA	TFG	PA
27	G	S.TOTAL	NOT SEEN	-	NO	52DB	30	GA	TFG	PA
28	AR	LARGE	ALL SEEN	POSTERO INFERIOR	NO	50DB	30	GA	TFG	PA
29	SA	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	38DB	20	GA	PG	PA
30	SK	S.TOTAL	NOT SEEN	-	PRESENT	62DB	32	GA	TFG	PA
31	NS	LARGE	ALL SEEN	POSTERO INFERIOR	NO	32DB	20	GA	PG	PA
32	S	LARGE	ALL SEEN	POSTERO INFERIOR	NO	48DB	30	GA	TFG	PA
33	SS	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	46DB	20	GA	TFG	PA
34	DSD	LARGE	ALL SEEN	POSTERO INFERIOR	NO	40db	20	GA	PG	PA
35	SN	SMALL	ALL SEEN	ANTERO SUPERIOR	NO	35DB	15	GA	TFG	PA
36	A	LARGE	ALL SEEN	POSTERO INFERIOR	NO	62DB	30	GA	TFG	PA
37	SK	S.TOTAL	ALL SEEN	-	PRESENT	55DB	30	GA	TFG	PA
38	SM	LARGE	ALL SEEN	POSTERO INFERIOR	NO	53DB	25	GA	PG	PA
39	JK	MEDIUM	ALL SEEN	ANTERO INFERIOR	NO	38DB	20	GA	TFG	PA
40	JK	S.TOTAL	NOT SEEN	-	NO	51DB	30	GA	TFG	EA

Sr. No	NAME	CANALOPLASTY	MEDIALISATION	LATERALISATION	GRAFT UPTAKE	HEARING GAIN	AB GAP	AB SHIFT
1	GK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	22
2	LS	NOT DONE	YES	-	YES	NOT IMPROVED	SAME	-
3	PA	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	24
4	BK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	12
5	K	NOT DONE	-	YES	FAILURE ON 3RD FOLLOW UP	NOT IMPROVED	SAME	-
6	SL	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	18
7	JK	NOT DONE	YES	-	YES	NOT IMPROVED	SAME	-
8	VS	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	16
9	N	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	15
10	RB	DONE	YES	-	YES	IMPROVED	IMPROVED	12
11	PS	DONE	-	YES	YES	IMPROVED	IMPROVED	14
12	MK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	8
13	JK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	24
14	SK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	16
15	RK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	16
16	BK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	26
17	JK	NOT DONE	YES	-	YES	NOT IMPROVED	SAME	-
18	JS	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	18
19	GS	DONE	-	YES	YES	IMPROVED	IMPROVED	12
20	LK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	14
21	A	NOT DONE	YES	-	FAILURE ON 2ND FOLLOW UP	NOT IMPROVED	SAME	-
22	G	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	14
23	ML	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	8
24	HK	NOT DONE	-	YES	YES	IMPROVED	SAME	-
25	M	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	8
26	S	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	12
27	G	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	24
28	AR	NOT DONE	-	YES	YES	NOT IMPROVED	IMPROVED	-
29	SA	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	12
30	SK	DONE	YES	-	YES	IMPROVED	IMPROVED	18
31	NS	NOT DONE	YES	-	YES	IMPROVED	SAME	-
32	S	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	18
33	SS	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	12
34	DSD	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	14
35	SN	NOT DONE	YES	-	YES	IMPROVED	SAME	-
36	A	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	20
37	SK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	20
38	SM	NOT DONE	YES	-	YES	NOT IMPROVED	SAME	-
39	JK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	12
40	JK	DONE	-	YES	YES	IMPROVED	IMPROVED	20

Sr. No	NAME	AGE	GENDER	RURAL	C/C	DURATION	ETIOLOGY	E. DROPS	CHARACTER	ODOUR	CONSISTANCY	C/S REPORT
41	SK	45	F	RURAL	DIS/HL	7 Y	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	-
42	KD	51	F	URBAN	DIS	2 Y	ASOM	CIPRO	MUCOID	-	MUCOID	ACINETOBACTER
43	BK	20	F	URBAN	DIS	2 Y	ASOM	POLYMIX	MUCOID	-	MUCOID	ACINETOBACTER
44	JK	62	F	URBAN	DIS/HL B/L	2 Y	ASOM	NO	NO DISCHARGE	-	-	-
45	LK	27	F	RURAL	B/L DIS	27	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	PSEUDOMONAS
46	PC	34	M	URBAN	DIS	3 Y	ASOM	POLYMIX	YELLOW	FOUL	MUCOPURULENT	STREPTOCCUS PNEUMONIAE
47	PS	58	M	RURAL	HL	10 Y	ASOM	NO	NO DISCHARGE	-	-	-
48	BK	25	F	RURAL	B/L DIS/HL	5YRS	ASOM	CIPRO	YELLOW	FOUL	MUCOPURULENT	-
49	G	21	M	RURAL	B/L DIS	21Y	ASOM	POLYMIX	YELLOW	-	PURULENT	STAPH AUREUS
50	BS	57	F	URBAN	DIS	3 Y	ASOM	CIPRO	YELLOW	-	PURULENT	STREPTOCCUS PNEUMONIAE

Sr. No	NAME	PERFORATION				PTA	AB GAP	ANAESTHESIA	GRAFT MATERIAL	APPROACH
		SIZE	MARGINS	LOCATION	GRANULOMA					
41	SK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	48DB	28	GA	TFG	PA
42	KD	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	68DB	30	GA	TFG	EA
43	BK	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	33DB	20	GA	PG	PA
44	JK	MEDIUM	ALL SEEN	POSTERO SUPERIOR	NO	48DB	20	GA	TFG	PA
45	LK	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	60DB	30	GA	TFG	PA
46	PC	MEDIUM	ALL SEEN	POSTERO INFERIOR	NO	33DB	15	GA	TFG	EA
47	PS	LARGE	ALL SEEN	POSTERO INFERIOR	NO	58DB	30	GA	PG	PA
48	BK	MEDIUM	ALL SEEN	ANTERO INFERIOR	NO	43DB	20	GA	TFG	EA
49	G	LARGE	ALL SEEN	POSTERO INFERIOR	NO	48DB	28	GA	TFG	PA
50	BS	S.TOTAL	ALL SEEN	-	NO	48DB	25	GA	TFG	EA

Sr. No	NAME	CANALOPLASTY	MEDIALISATION	LATERALISATION	GRAFT UPTAKE	HEARING GAIN	AB GAP	AB SHIFT
41	SK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	16
42	KD	NOT DONE	-	YES	YES	NOT IMPROVED	SAME	-
43	BK	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	10
44	JK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	10
45	LK	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	20
46	PC	NOT DONE	-	YES	YES	IMPROVED	IMPROVED	10
47	PS	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	16
48	BK	NOT DONE	-	YES	FAILURE ON 3RD FOLLOW UP	NOT IMPROVED	SAME	10
49	G	NOT DONE	-	YES	YES	NOT IMPROVED	SAME	16
50	BS	NOT DONE	YES	-	YES	IMPROVED	IMPROVED	20

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he Principal,
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ubject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 29.05.2019 has pproved the plan of thesis of **Harjinder Singh**, a student of your college for **MS torhinolaryngology (ENT)** along with the names of Supervisor/Co-Supervisor as under:-

pic Plan of Thesis

omparative study of malleus medialisation and lateralisation tympanoplasty

ervisor
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e student has to submit the four copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, idkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the mination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if).

Dr. S P Singh MS(Oph)
Controller of Examinations

e:

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

In

OTORHINOLARYNGOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER, 2018

DR HARJINDER SINGH

DEPARTMENT OF OTORHINOLARYNGOLOGY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY
For the degree of	M.S. ENT
Name of the candidate	Dr. Harjinder Singh
Supervisor	Dr. Manish Munjal, Professor & Head, Department of ENT, DMCH, Ludhiana
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Institution	Dayanand Medical College and Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Tympanoplasty is a procedure which deals on repair of the tympanic membrane. The technique can be categorized as underlay, overlay depending on the placement of the graft material. This study is to compare and overlay technique in terms of the closure of the membrane defect.

AIMS AND OBJECTIVES

1. To observe the surgical outcome of tympanoplasty in safe ear CSOM cases in the form of graft uptake, position of graft and mobility of graft.
2. To evaluate the success of tympanoplasty in the form of audiological hearing gain.

Materials and Methods: In this prospective clinical study the patients admitted with chronic supporative otitis media in a period of 1.5 yrs will undergo tympanoplasty (malleus medialisation or mlateralisation) at dept of ENT Dayanand medical college and hospital Ludhiana.

Clinical significance: This study tends to compare the efficacy of two techniques of tympanoplasty to see the graft uptake rate, audiological hearing gain, position of graft in the post op period, mobility of graft attained

Keywords: Tympanoplasty, temporalis fascia, tympanic membrane, perforation, Malleus medialisation, lateralization.

(Signature)	(Signature)	Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY"** exist in the Department of ENT at Dayanand Medical College and Hospital, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate herself under our supervision and guidance.

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APPROVAL PROFORMA
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Approved : Yes / No

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PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

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3	COURSE OF STUDY AND SUBJECT	M.S. ENT
4	DATE OF ADMISSION OF COURSE	9 MAY 2018
5	TITLE OF THE TOPIC	COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Chronic suppurative otitis media is a insidious disease defined as the persistent infection or inflammation of the middle ear and the mastoid air cell system, It typically involves a perforation of the tympanic membrane with intermittent or continuous otorrhea. Moreover it increases the likelihood of cholesteatoma formation.[1]

Long standing perforation leads to recurrent ear discharge, recurrent otitis externa and even threatens inner ear function.[2] It clinically manifests as discharge from the ear and reduced hearing and affects both sexes in all age groups.

Prevalence of chronic otitis media is estimated to be 0.5-30% with 120 million patients around the world. Essential treatment of chronic otitis media is by surgical intervention to eliminate disease, prevention of recurrence and maintain or improve hearing. About 70000 "tympanoplasty" and "mastoidectomy" operations are performed annually in The United States.[3]

A perforation of the tympanic membrane leads to defect in impairment of the protective function of the Eustachian tube and the middle ear so that there is no air cushion protecting the middle ear and mastoid air cells, thereby secretion from the nasopharynx enter the middle ear through the eustachian tube leading to further hearing impairment /Charles and Bluestone 1983.

Tabb and Shea first innovated medial positioning of grafting tissue to malleus and residual tympanic membrane.[4-7]

Otologic surgeons may choose either method depending on the characteristics of the defect.[8]

According to the American Academy of Ophthalmology and Otolaryngology Subcommittee on Conservation of Hearing 1965, 'tympanoplasty' is a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting.[9]

Major prerequisite for a successful tympanoplasty are a dry ear /Armstrong, 1965/ and a good Eustachian tube function /Miller 1965, Flisberg, 1966/. Para nasal sinuses and throat should be free of any infective focus /P.C. Chamyal, S.R.V. Kessar et al., Sept. 1981. The mucosa of middle ear should appear to be normal to the naked eye and on otomicroscopy T. Palva, 1970.

Grafting the tympanic membrane with an autologous temporal fascia create a functional middle ear free of infection which clinically means closure of air bone gap and a dry ear /Adolph Wolferman, 1980.

Conventionally, surgeons perform tympanoplasty on ears with active drainage after drying the ear, but in many cases this is practically impossible because the discharge from the ear continues despite receiving medical treatment.[10]

There are two techniques of tympanoplasty with respect to placement of the graft ie. overlay and underlay technique.[11]

The classical overlay technique was described bt Sheehy in 1967. In this, incision in the bony canal wall is made along the two suture lines. Demarcating the vascular strip. The canal skin is elevated from the bone as far as the fibrous annulus. The annulus is not elevated from the bony sulcus. The dissection is continued into the tympanic remnant separating the squamous epithelial layer from the middle fibrous layer. The tymporalis fascia placed on the fibrous layer of tympanic membrane. A small slit on the fascia allows this to envelop the handle of malleus (Sheehy, 1967).

Fisch(1981) recommends an overlay technique for perforation which do not have an anterior rim and overlay technique for those with an anterior rim. If blunting and lateralization kept to minimum the hearing result of overlay procedure can be quite good. Uptake rates are excellent (Glascock, 1973).

Underlay technique was first described by Shea et al, 1960. In this technique, temporalis fascia graft placed below the tympanomeatal flap extending upto the anterior limit of annulus and medial to the handle of malleus.

The solution of problems like blunting, lateralization, pearl formation, delayed healing associated with overlay technique has been dealt with using underlay technique (Shambaugh, 1990).

The main reason in deciding to use underlay techniques was it being faster and easier to perform (Symth, 1970) and to prevent the complications of blunting and epithelial pearls underlay technique is advocated (Glasscock, 1973).

In underlay technique the fascial graft is pierced in order to make a hole for the malleus handle to pass through it. At first, the hole is passed through the tip of malleus handle and then the graft is stretched over it to fit around the neck of malleus so that the graft lodges medial to malleus.

There are chances of lateral migration of the tympanic membrane away from the handle of malleus, leads to conductive hearing loss, may occur after some time and is most frequently seen when graft placed lateral to the handle of malleus rather than medial to it.

Thus the present study is to evaluate and compare the two results of techniques of tympanoplasty i.e. where is graft placed medial or lateral to the handle of the malleus and patients will be followed up:

To observe the surgical outcome of tympanoplasty in safe ear chronic supporative otitis media

1. Inference of graft uptake.
2. Audiological hearing gain.
3. Position of the graft in the post op period
4. Mobility of the graft attained

6.2 REVIEW OF LITERATURE

Tympanoplasty is an established operative procedure used in the reconstruction of a perforation of the tympanic membrane (TM). The term "TYMPANOPLASTY" was coined by Wullstien 1953 to describe surgical reconstruction of the middle ear hearing mechanism.

Tympanic membrane is accessed by three primary approaches namely transmeatal, endaural, and postauricular. The universally accepted reconstruction modalities of tympanic membrane repair are the underlay or overlay graft techniques. These approaches and techniques have their advantages and disadvantages.[12,13]

The surgical techniques include "loop overlay" tympanoplasty [14], sandwich graft Tympanoplasty [15], over-under tympanoplasty [16], mediolateral graft tympanoplasty [17], and others.

Chronic otitis media is one of the most common otological diseases in the developing world. CSOM is defined as the persistent infection or inflammation of the middle ear and mastoid air cells. It typically involves a perforation of the tympanic membrane with intermittent or continuous otorrhea. This condition increases the likelihood of cholesteatoma formation.[18] Middle ear disease is the primary cause of hearing loss in children and has a significant impact on language development and academic performance.[19]

A WHO / CIBA FOUNDATION WORKSHOP in 1996 produced the following definitions:

Chronic suppurative otitis media: 'a stage of ear disease in which there is chronic infection of the middle ear cleft , I.e. eustachian tube , middle ear and mastoid, and in which a non intact tympanic membrane (e.g. perforation

ortympanostomy tube) and discharge are present'. Chronic otitis media: 'includes both chronic suppurative otitis media and chronic perforationof tympanic membrane.'[20]

Sheehy and Shelton have suggested that tympanoplasty should eradicate pathological conditions from the middle ear.[21]

Robert and colleagues examined the risk factors of re-perforation following Myringoplasty surgery. They analyzed the impact of such factors such as age, sex, ear discharge, status of the opposite ear, hearing loss and surgical approach and technique on the results of Myringoplasty. Based on a statistical analysis, they finally introduced surgical technique as the more effective factor on the final results of Myringoplasty.[22]

Hosney and colleagues studied the outcome of myringoplasty in wet and dry ears and found that there was no statistically significant difference between wet and dry ears in graft taking and hearing improvement.[23]

A retrospective study of 423 myringoplasties carried out to compare if size of the perforation affects the outcome of myringoplasty showed that size does influence success; the success rate for small perforations was 74.1% compared with 56.0% for large perforations (P = 0.0003),[24]

A comparative study of graft placed medial or lateral to handle of malleus in tympanoplasty was conducted and results of the two techniques were compared in terms of graft take-up rate, hearing improvement and complications at the end of 6month follow-up. The graft take-up rate and post operative gain in air conduction in group A was 91.30%, 3.57+/-6.61 dB (mean+/-SD) respectively and it was 96.55%, 6.62+/-6.86dB (mean+/-SD) respectively in group B (p value is >0.05). Which were statistically analysed by

Chi-square and T-test. Conclusion- there is no difference in graft take-up rate, gain in hearing or complications in both the techniques, in consideration of the duration of surgery, technicality and healing, placement of graft lateral was found to be better than medial to the handle of malleus in modified inlay technique of myringoplasty.[25]

Two hundred patients with chronic otitis media, tubotympanic disease, inactive stage who underwent tympanoplasty by the 360 degree subannular technique between the years 2009 to 2013 were selected for the study as and when they were admitted. All the patients were followed up for 6 months following surgery. Any complications like secondary infection, wound dehiscence, granulations, were looked for and treated appropriately. Status of the neotympanum was evaluated at the end of 3 months. Any anterior blunting, medialisation or lateralisation of the graft was noted. Any residual perforation was considered as failure. Hearing was evaluated in all patients with an intact neotympanum. Study showed an overall success rate of 96% as far as graft uptake was concerned. Hearing improvement was seen in 93% of our patients. 6 patients had complete air bone gap closure, 49 had AB gap of 10db or less, 131 had AB gap of 11-20db. 14 patients had no improvement in hearing. Overall hearing improvement was seen in 93% of our patients. In conclusion 360 degree sub-annular tympanoplasty is a efficient technique of tympanoplasty with very good results.[26]

Other study to compare tympanic membrane grafting medial or lateral to handle of malleus contained 28 patients in Group A and 28 in Group B. Overall success rate was 94.64% that was 96.42% in Group A, and 92.85% in Group B. Differences of air-bone gap in each group before and after surgery

was 16.10 (±4.89) in Group A, and 15.78 (±3.40) in Group B. Improvement of hearing level was not significant between two surgical methods (P = 0.442). This study shows Both techniques (medial and lateral to malleus handle) of TM grafting are effective with success rates 96.42% and 92.85% respectively.[27]

Another study with 302 patients with chronic otitis media, 114 who had a perforation that involved over 50 % of the pars tensa were enrolled in the study. The underlay technique was used in 61 patients, and the over-underlay technique in 53 patients. In the underlay group, the preoperative mean perforation size was 30.11 ± 5.35 mm (2) (range 20.00-52.00 mm(2)) (n = 61). In the over-underlay group, the preoperative mean perforation size was 31.41 ± 8.65 mm (2) (range 22.00-48.00 mm(2)) (n = 53). The graft success rate of tympanoplasty performed using the underlay technique was 89.1 % in 61 patients. Seven (10.9 %) patients had graft failure. The graft success rate with the over-underlay technique in 53 patients was 90.5 %. Five (9.5 %) patients had graft failure in this group. Three graft lateralizations (5.6 %) and two retractions (3.8 %) were observed at 12 months postoperatively in the over-underlay group. However, in the underlay group, no graft lateralization but five retractions (8.2 %) were observed at 12 months.[28]

One hundred forty-one tympanoplasties were analyzed. In the early postoperative period, 140 (99%) of 141 grafts were intact and, at a mean of 32.1 months, 121 (85.8%) remained without significant retraction or reperforation. There were no cases of early or delayed graft lateralization. The mean preoperative and most recent postoperative air-bone gaps were 23.7 dB and 14.1 dB, respectively ($p < 0.001$). Surgery was not associated with a

transient or long-term bone conduction threshold shift. Conclusion was that The LMUT technique offers improved exposure of the tympanic space and a low rate of graft failure. The risks of sensorineural hearing loss with ossicular chain manipulation and tympanic membrane lateralization from graft placement lateral to the malleus are very low.[29]

A study to compare between underlay and over underlay technique of tympanoplasty was conducted and In group I, 25 (83.3%) patients had a full take of the graft at the 3-month follow-up. In group II, 27 (90%) patients had a full take of the graft at the 3-month follow-up. These patients did not develop severe graft lateralization, infection or blunting (p 0.7). In group I, the hearing improvement or the decrease in air bone gap is by 11±7.2db while in group II, the improvement of hearing or decrease in air bone gap is by 12.2±7db (p 0.52).There were high success rate of graft up take and considerable hearing improvement in both techniques of myringoplasty. No statistically significant difference in both the techniques was proved.[30]

An other study to compare over underlay grafting with conventional underlay grafting myringoplasty was conducted in which Graft uptake and hearing improvement was comparable in both groups. Although the graft uptake was 5% lower in the group which underwent conventional underlay myringoplasty (90%) as compared to over-underlay myringoplasty (95%), however, the difference was not statistically significant (P = 0.5). However, there was statistically significant difference in gain in hearing threshold (gain in A-B gap) in the conventional underlay myringoplasty (14.5 dB ± 7.236) as compared to over-underlay myringoplasty (18.75 dB ± 5.349) (P = 0.04). Conclusion: The over-underlay technique, which is a hybrid of both overlay and underlay

technique, allows the advantages of both methods. It improves the graft uptake rate and hearing in subtotal and large perforation.[31]

6.3 AIMS AND OBJECTIVES OF THE STUDY

1. To observe the surgical outcome of tympanoplasty in safe ear CSOM cases in the form of graft uptake, position of graft and mobility of graft.
2. To evaluate the success of tympanoplasty in the form of audiological hearing gain.

7. MATERIALS AND METHODS

7.1. SOURCE OF DATA

Patients coming to ENT OPD with Chronic Supporative Otitis Media in a period of 1.5 year from 1st November 2018 to 31st April 2020. Malleus medialisation and lateralisation tympanoplasty will be performed. Patients will be followed up for any complications or recurrence.

7.2. METHODS OF COLLECTION OF DATA

INCLUSION CRITERIA

Patients with diagnosis of CSOM (patients of both sexes, patients undergoing surgery for the first time for concerned ear and participants) will be selected after a thorough ear nose and throat examination and clinical systemic examination with history after taking consent. They will then undergo tympanoplasty.

EXCLUSION CRITERIA

1. Patients without CSOM
2. Presence of any other external or middle ear pathology such as stenosis of EAC, cysts, otosclerosis.
3. H/O head trama with documented temporal bone fracture.
4. Patients with persistent U.R.T.I.
5. Patients who had any type of previous tympanoplasty done for same ear.
6. Patients with unsafe chronic otitis media.
7. Participants' parents not willing to give written consent to take part in the study.

Initial patient work-up:

Included detailed history taking, the symptoms and their duration. Thereafter, general physical examination, detailed Ear Nose Throat examination specially for any source of chronic infection or allergy, including examination under microscope, PTA with proper masking and relevant laboratory investigations.

A proforma will be made where preoperative information like age, sex, history of adenoidectomy, or tonsillectomy, history of ventilation tube placement, site of perforation and otoscopic findings will be recorded.

Postoperatively all the patients will be put on oral antibiotics and analgesics. All patients will be instructed to take adequate precautions to prevent entry of water into the ear canal. Skin stitches will be removed after 7-8 days. Antibiotics will be continued for 14 days. Status of graft and hearing evaluation by PTA will be done at 6 weeks, 12 weeks and 24 weeks postoperative.

Audoilogical Assessment- Pure tone audiometry- Pure tone average hearing thresholds will be calculated for each patient at 500, 1000, 2000, 4000 and 8000HZ. Normal hearing sensitivity will be defined as hearing threshold of less than 25Dbhl at each frequency tested within the range of 0.25 to 8 kHz.

X-RAY MASTOIDS- X-RAY mastoids (wherever required) will be done to see the type of pneumatisation, sclerosis and any anatomical anomalies such as anterior lying sigmoid sinus and low lying dura.

OUTCOME: The outcome of this study will be studied based upon

1. To observe the surgical outcome of tympanoplasty in COM cases in the form of graft uptake.

2. To evaluate the success of tympanoplasty in the form of audiological hearing gain.
3. position of the graft in the post op period
4. mobility of the graft attained

STATISTICAL ANALYSIS:

Data will be described in terms of range; mean ± standard deviation (± SD),median, frequencies (number of cases) and relative frequencies (percentages)as appropriate. Comparison of quantitative variables between the groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test will be used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 17 version statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

In this study, it is planned to study the results after tympanoplasty. As discussed, patients will have to undergo audiological assessment and radiological investigations as follows-

1. Pure tone audiometry
2. Examination under Magnification

7.4 HAS ETHICAL CLEARENCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Yes attached herewith.

8. LIST OF REFERENCES

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PROFORMA

Sr. No.

NAME AGE/SEX

ADMISSION NO. CR. NO.

DOA DOD

ADDRESS

CHIEF COMPLAINTS

DISCHARGE DURATION

HEARING LOSS DURATION

HISTORY

H/O TRAUMA/ASOM

H/O EAR DROP INSTILLATION YES/NO

IF YES (COMPOSITION)

H/O EAR DISCHARGE

IF YES COLOUR YES/NO

SMELL

CONSISTENCY

C/S REPORT- ORGANISM SENSITIVITY

LAB. REPORTS DMC/OUTSIDE

PERFORATION

SIZE OF PERFORATION

SHAPE OF PERFORATION

SADE GRADE OF PERFORATION

DIAGRAM

Signature of Candidate **Signature of Supervisor**

MARGINS OF PERFORATION

1. INVERTED/EVERTED
2. ALL MARGINS SEEN
3. ALL MARGINS NOT SEEN
   a) Anterior
   b) Antero-inferior
   c) Antero-superior
   d) Superior
   e) Posterior
   f) Postero- inferior
   g) Postero-superior

- GRANULOMA ON MARGINS YES/NO
- ANY OSSICLES SEEN

MALLEUS- LONG PROCESS/UMBO/HEAD

INCUDOSTAPEDIAL JOINT

STAPES SUPRASTRUCTUR/FOOTPLATE

AUDIOGRAM **R/E** **L/E**

- PREOPERATIVE PTA
- A-B GAP IN PTA
- AC LEVEL
- BC LEVEL

OPERATION UNDER LA

GA

MAC

Signature of Candidate **Signature of Supervisor**

APPROACH

- POST-AURAL
- ENDAURAL
- TRANSCANAL PERMEATAL

INTRAOPERATIVE STATUS

	Graft placed medial to handle of malleus	Graft placed lateral to handle of malleus
Procedure Name		
Procedure Findings		

Signature of Candidate **Signature of Supervisor**

POST OPERATIVE FOLLOW UP

EUM (Graft status)	6wks	12wks	24wks
PTA	6wks	12wks	24wks

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....

am willing to participate in the study **"COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

.....
Signature of the Witness

Name:

.....
Signature of the patient

Signature of Candidate

Signature of Supervisor

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य "**"COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"COMPARATIVE STUDY OF MALLEUS MEDIALISATION AND LATERALISATION TYMPANOPLASTY" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____
ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ

_____
ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____

ਮਿਤੀ_____

ਪਤਾ _____

ਪਤਾ _____

_____
ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____
ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ